

SOUTHEASTERN BIOLOGY

QH301
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v. 52
no. 2
Apr 2005



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April, 2005

Number 2

ASB **ASB 66TH ANNUAL MEETING** *ASB* **APRIL 13-16, 2005**

ASB **The University of North Alabama** *ASB*
Florence, Alabama

ASB See Page 63 and Consult Website *ASB*
<http://www.asb.appstate.edu/Preliminary2005.htm>



UNA's Administration Building and Laura M. Harris Plaza

The Official Publication of
The Association of Southeastern Biologists
<http://www.asb.appstate.edu/>

SOUTHEASTERN BIOLOGY

(ISSN 1533-8436)

SOUTHEASTERN BIOLOGY (ISSN 1533-8436) is published quarterly in January, April, September, and December by the Association of Southeastern Biologists, Inc., Carolina Biological Supply Co., 2700 York Road, Burlington, NC 27215. Periodicals postage paid at Burlington, NC, and additional mailing offices. POSTMASTER: please send address changes to the SOUTHEASTERN BIOLOGY business manager, Tim Atkinson, Carolina Biological Supply Co., 2700 York Road, Burlington, NC 27215. ASB members receive the SOUTHEASTERN BIOLOGY as part of their membership dues. For non-members, the cost is \$7.00 per issue.

All contributions, inquiries about missing numbers and other matters should be addressed to the Print Editor. News items should be sent to the News Editor. Send books to be reviewed to the Book Review Editor. Printed by Allen Press, 810 East 10th Street, Lawrence, KS 66044.

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PURPOSE

The purpose of this association shall be to promote the advancement of biology as a science by encouraging research, the imparting of knowledge, the application of knowledge to the solution of biological problems, and the preservation of biological resources. The ASB has representation in Section G Committee of the AAAS. Varying types of membership are available to individuals and institutions. See inside back cover.

TIME AND PLACE OF FUTURE MEETINGS

2005	April 13-16: Hosted by the University of North Alabama, Florence, Alabama.
2006	March 29-31, April 1: Hosted by the University of Tennessee, Knoxville, Tennessee.
2007	April 18-21: Hosted by the University of South Carolina, Columbia, South Carolina.
2008	April: Hosted by Furman University, Greenville, South Carolina.

A MESSAGE FROM THE PRESIDENT

CLAUDIA L. JOLLS

January 2005

Presidents often are indulged in a somewhat premature perspective of their service. We in ASB are no exception, asked in January to present our year in review to our membership in April. Thus, I have the pleasure of reflecting on what has been and what might be.

It has been a time of new connections, including personal friendships that arise from these working relationships with our 17 committees and 10 affiliates, including our new colleagues of the Society of Herbarium Curators. Our Executive Committee is working with at least three other professional scientific societies, with southeastern regional chapters, as part of our continuing goal of expanding ASB's mission as an umbrella organization. We have confirmed our place of meeting for 2008 at Furman University in Greenville, South Carolina, thanks to our Place of Meeting Committee. Our Patron Members and Exhibitors Committee, Scott Jewell (ASB Convention Services Manager), members of the Executive Committee and several Local Arrangements Committees strive to meet the needs of patrons and exhibitors, strengthening our ties, and present our membership with new products and opportunities for teaching, research and service.

It is interesting how these new relationships and alliances are formed by working on committees together, by responding to research or news in *Southeastern Biology*, or sharing a moment at an ASB social. A phone call the other day began with what I erroneously assumed to be a "cold call" solicitation from a vendor of scientific instrumentation. The call turned out to be from a regional sales director who offered, "We would very much like to develop a relationship with ASB. You are just the type of group with whom we need to interact. What can we do?" Fortunately, I recovered quickly and had no lack of suggestions. As in the past, this new potentially fruitful new union was prompted by an ASB member who used their instruments and said, "You really need to be involved with ASB." Our patrons, Associated Microscope, Inc., Tim Atkinson, Carolina Biological Supply Company, Dennis, Breedlove and Associates, Inc., Martin Microscope and Thomson-Brooks/Cole, as well as our dozens of exhibitors, have set the bar high with sponsorships of awards and events. Thank you all for promoting ASB. Please continue to do so and also welcome our new members, affiliates, exhibitors and patrons to ASB in Florence.

As the face of science changes, new relationships mean new connections and reaching out to include under-represented groups. With

this goal, our Committee on Women, Minorities and Persons with Disabilities is sponsoring a lunch time discussion of ways to diversify our societies and bring more minority students, professionals and their institutions and organizations into our membership. Again, ASB is an organization, which by its nature, can play a leadership role in these efforts.

Perspectives, then, are often of what has been, what is and what may be; however, these must not be confused. It is fallacious to assume because "It has happened before" that "It can never happen again (or here)." It happened in Dayton, Tennessee (1927), Little Rock, Arkansas (1968), and Louisiana (1987); the teaching of evolution was put on trial. Like the proverbial ostrich, it is tempting to ignore the debate as something past or remote, which will not impact us professionally or personally. Yet, Cobb County, Georgia, Dover, Pennsylvania, and Grantsburg, Wisconsin, are just a few places where the teaching of evolution in the classroom is currently under public scrutiny, litigation and/or political fire. ASB, like the American Association for the Advancement of Science, American Institute of Biological Sciences, the National Association of Biology Teachers and National Association of Science Teachers, has acknowledged these issues with our April 2004 Statement Concerning the Teaching of Creationism and Intelligent Design.

Let us not delude ourselves into thinking this is a K-12 concern. As a university professor, I am reminded that education in the ivory tower is not isolated from such debates. Courses are taught at private and public institutions (Baylor University in Texas, Wheaton College in Illinois, Saginaw Valley State College in Michigan, UC-Berkeley and University of Minnesota-Twin Cities) in which the scientific theories of natural selection and evolution share the syllabus with purported alternatives, most recently "intelligent design" (with the moniker "ID"). Some of us remember the controversy generated at Baylor by the establishment and later dissolution of the Polanyi Center. While one criticism of ID is its absence from established, scientifically-based, peer-reviewed professional journals, there is no lack of publication on the subject. There are impressive web sites and books, from academic presses in some cases (ISI Books, Intervarsity Press, Cambridge University Press). ID has infiltrated the academy, with funded think tanks and research fellows (Discovery Institute's Center for Science and Culture), societies (International Society for Complexity, Information, and Design) and a journal (*PCID: Progress in Complexity, Information and Design*). This month's issue of *Academe*, the publication of the American Association of University Professors, presents "Wedging Creationism into the Academy." In this article, one of our symposium speakers, Barbara Carroll Forrest, and Glenn Branch discuss the insidious nature of views, which in the

name of academic freedom, could undermine teaching scientific legitimacy and legitimate science.

Our ASB Education Committee has done an impressive job in organizing a symposium "Teaching Evolution and the Challenge of Intelligent Design" for our 66th annual meeting in Florence, hosted by the University of North Alabama. Presentations by noted speakers include Drs. Barbara Carroll Forrest, Taner Edis, Keith Miller and Massimo Pigliucci, our plenary speaker. Like most issues worthy of consideration, these presentations will inspire question, comment and controversy, but such is the foundation of how and why we do science. This topic and others intrigue me, as I consider what it means to be a biologist, both as a professional and a person. Undoubtedly, these are discussions we all need to hear and have. Perhaps it is not so much where we stand, as much as whether we stand up to hear and be heard. It is time to shake the sand out of our ears.

ASB continues to provide fuel for my professional and personal fires. My thanks for the privilege of serving you and this truly great organization; enjoy the meetings and have fun.



Claudia L. Jolls, ASB President

ASB CANDIDATES FOR OFFICE—2005

The Nominating Committee composed of J. Kenneth Shull (Chair), Cliff R. Hupp, and Ken McLeod has selected the following slate of nominees for the ASB offices to be filled in 2005. Voting will take place at the annual business meeting at 11:30 A.M. on Friday, April 15, 2005. Additional nominations will be accepted from the floor before voting is conducted. Please plan to attend and vote. Elections can sometimes be close. Therefore, your vote could make a difference on who gets elected to office.

<i>President-Elect</i>	Kim Marie Tolson	University of Louisiana Monroe, Louisiana
	James C. Hull	Towson University Towson, Maryland
<i>Vice-President</i>	W. Michael Dennis	Breedlove, Dennis & Associates Orlando, Florida
	Thomas R. Wentworth	North Carolina State University Raleigh, North Carolina
<i>Treasurer</i>	Timothy A. Atkinson	Carolina Biological Supply Co. Burlington, North Carolina
<i>Executive Committee</i>	Robert Y. George	George Institute for Biodiversity & Sustainability Wilmington, North Carolina
	Richard N. Henson	Appalachian State University Boone, North Carolina
	Dennis C. Haney	Furman University Greenville, South Carolina
	Jennifer J. Davis	Shorter College Rome, Georgia



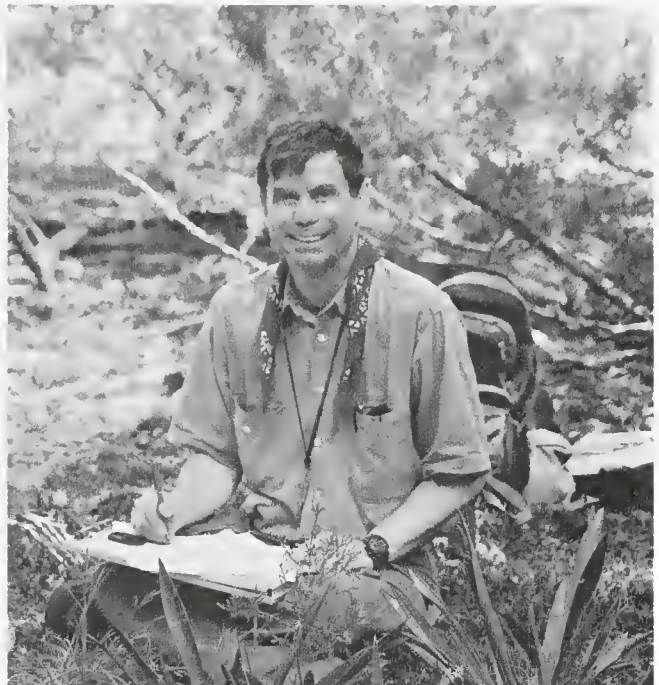
Kim Marie Tolson



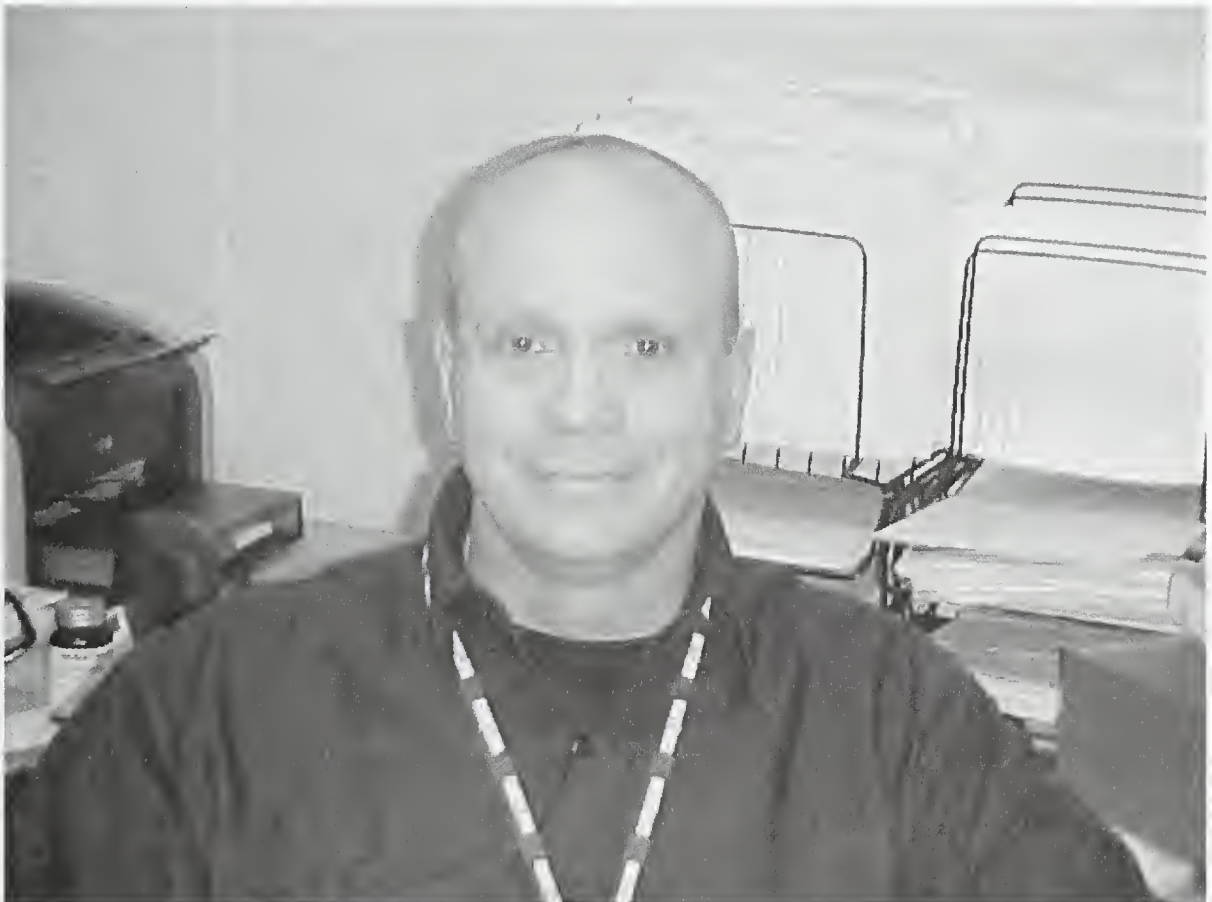
James C. Hull



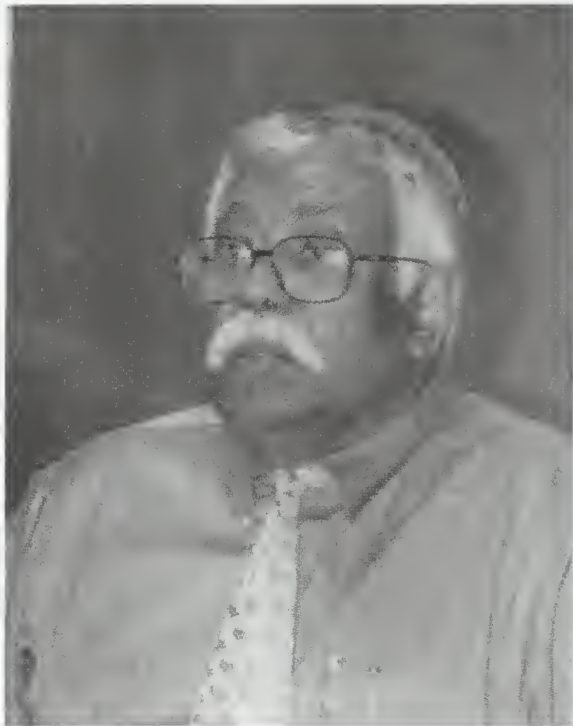
W. Michael Dennis



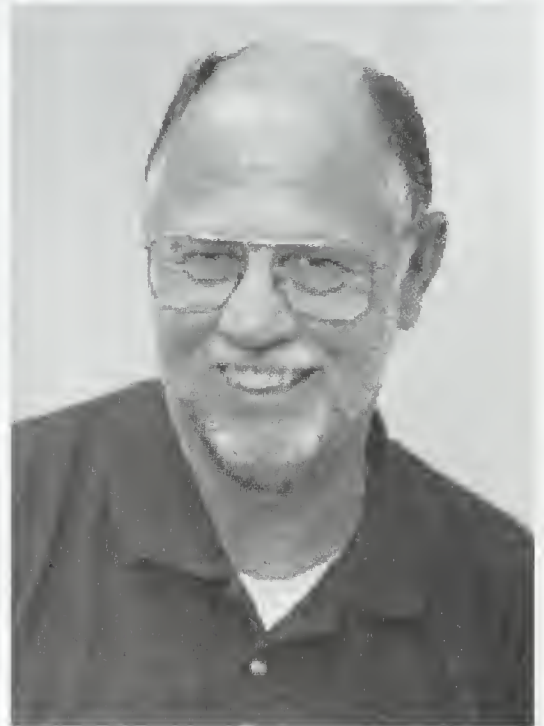
Thomas R. Wentworth



Timothy A. Atkinson



Robert Y. George



Richard N. Henson



Dennis C. Haney



Jennifer J. Davis

PRESIDENT-ELECT

Kim Marie Tolson – Dr. Tolson is an Associate Professor of Biology at The University of Louisiana at Monroe where she also serves as the Coordinator of Graduate Studies for the Department. She received her undergraduate degree in Wildlife Conservation and Management from Louisiana Tech University and her Ph.D. from Northeast Louisiana University. She has been a member of the graduate faculty at ULM since 1988 where she teaches wildlife management courses and physiology to upper-level biology majors. Her research interests include vertebrate physiology and the management of both game and non-game animals. Dr. Tolson has participated in co-operative research projects with state, federal, and non-governmental agencies. Her current graduate students are supported by half a million dollars in extramural funds.

Kim Marie has been an active member of ASB since 1990 and she has served in the following capacities: Local Arrangements Chair for the 59th Annual Meeting, Chair of the Place of Meeting Committee (twice), Executive Committee Member at Large, Chair of the Enrichment Fund, and Vice-President. She serves on numerous department, college, and university committees at ULM. She is a founding member of the Ark-La-Miss Wildlife Study Group and has co-hosted two symposia on regional wildlife management issues. Kim Marie is also a popular speaker for local civic groups and organizations in northeast Louisiana.

James C. Hull – Dr. Hull is a professor of Biological Sciences at Towson University, Towson, Maryland. He received his B.A. (1968) and Ph.D. (1974) degrees from the University of California at Santa Barbara. He held teaching appointments at UCSB and Bishops University, Lennoxville, Quebec, Canada, before becoming a faculty member at then Towson State University in 1976 where he teaches botany and plant ecology. He is a member of Association of Southeastern Biologists, Southern Appalachian Botanical Society, AIBS, Ecological Society of America, and Sigma Xi. He has been a member of ASB since 1977. He has served as ASB as Local Arrangements Chairman for the ASB meeting in Baltimore (1990), Place of Meetings Committee, ASB Treasurer, Finance Committee, and a member of the Auditing Committee.

His research interests are in the environmental constraints on the distribution of plants. This has led to appointments as a Plant Ecologist to the Smithsonian Institution Environmental Research Center (1980) and as Visiting Scholar at Stanford University (1984-85). In the southeast his research has spanned examination of nitrogen cycling in successional systems, plant recruitment and recovery following debris avalanches, water relations of oaks on serpentine soils, role of sunflecks in photosynthetic acclimation, recently the role of exotic invasive plants on a Maryland endangered species. He was selected for the Outstanding Faculty Award and Professional Service Award for the College of Science and Mathematics at Towson University.

VICE-PRESIDENT

W. Michael Dennis – Dr. Dennis is President and a Senior Scientist of Breedlove, Dennis & Associates, Inc., a natural resources based environmental consulting firm which has offices in Orlando and Tallahassee, Florida, and

Nashville, Tennessee. He is also a visiting professor at the University of Tennessee, where he has taught courses on Aquatic and Wetland Plants of the Tennessee Valley for over 20 years. Dr. Dennis received a B.S. in Biology from Emory University, a M.S. in Biology from the University of South Carolina and a Ph.D. from the University of Tennessee. For 5 years he studied and published research on aquatic plants of the Tennessee Valley working with the Tennessee Valley Authority. He is a practicing ecologist and consults and provides expert witness testimony in the areas of wetlands, wetland mitigation, threatened and endangered species, vegetation and wildlife. Dr. Dennis is a life member of ASB and has served as Chair of the ASB Enrichment Fund, a member of the Patron Committee and has previously been elected as Executive Committee Member at Large. BDA has also been a longstanding Patron Member of ASB.

Thomas R. Wentworth — Dr. Wentworth is Alumni Distinguished Undergraduate Professor of Botany at North Carolina State University. Tom graduated from Dartmouth College in 1970 with a bachelor's degree in biological sciences. He received his Ph.D. in plant ecology from Cornell University in 1976, when he joined the Department of Botany at NC State University. His research focuses on plant community ecology, with special interest in the description and classification of vegetation and the environmental interpretation of community patterns. Much of his recent research has focused on the vegetation of the Carolinas. Tom has served on the Board of Directors of the Organization for Tropical Studies (1978-1988), and he has served on the Board of Scientific Advisors (1979-present) and the Board of Directors (1987-present; chair 2001-present) of the Highlands Biological Station. He is a member of the Ecological Society of America, the Botanical Society of America, The Torrey Botanical Society, the Southern Appalachian Botanical Society, the British Ecological Society, the International Association for Vegetation Science (IAVS), and the honor societies of Phi Beta Kappa, Phi Kappa Phi, and Sigma Xi. He was Business Manager of the North American Section of IAVS from 1991-1995.

Tom has been a member of ASB since 1976 and has attended many of its annual meetings since that time. He joined the ASB Audit Committee in 1988 and chaired that committee in 1990-1991. He joined the ASB Senior Research Award Committee in 1998 and chaired that committee in 2000-2001. He was awarded ASB's Meritorious Teaching Award in 2001; he joined the Meritorious Teaching Award Committee in 2001 and chaired that committee in 2003-2004. He is currently a Member-at-Large of the ASB Executive Committee and chairs the ASB Publications Committee.

TREASURER

Timothy A. Atkinson – Tim is the current ASB Treasurer and was elected to this office in 1999. He is an Assistant Director at Carolina Biological Supply Company, Burlington, North Carolina. He received his AS (1971) in Physical Education and Biology from Gadsden State Junior College, Gadsden, Alabama; BS (1974) in Biology and Physical Education, and MS (1977) in Biology from Jacksonville State University, Jacksonville, Alabama; and studied Ecosystematics under A. E. Radford at UNC Chapel Hill until starting at Carolina Biological (1980). He has performed contract work for the US Department of

Defense, US Department of Energy, US Forest Service, US Fish and Wildlife Service, US Bureau of Land Management, The Nature Conservancy, and many private researchers. He has published steadily for over 30 years, including books, journal, magazine, and newspaper articles, videos, e-publications, and several treatments in Flora North America. Although not in a teaching position, Tim remains active in teaching through the training of teachers in Carolina Biological's Professional Development Workshops. Tim first became involved in ASB as a student in 1974 and currently is an individual patron member as well as representing the patron membership of Carolina Biological Supply Company.

EXECUTIVE COMMITTEE

Robert Y. George – Dr. George is president of George Institute for Biodiversity and Sustainability (GIBS), founded in 2003 as a non-profit organization dedicated to conservation of nature. He served as Professor of Biological Sciences at the University of North Carolina at Wilmington from 1973 to 2003. He received his Ph.D. from the University of Madras, postdoctoral training at the Friday Harbor Laboratory of the University of Washington. He was Research Associate Professor at Duke University for two years after his postdoctoral research. He received research grants to study coastal ecosystems in relation to oil and gas drilling in the Gulf of Mexico while serving as adjunct professor of oceanography at Florida State University (1968-72). His research interest is conservation and ecosystem-based management of coastal marine ecosystems. Dr. George was the chair of the local arrangement committee 60th annual meeting ASB at UNCW. He served for 3 years in the ASB Place of Meeting Committee. Dr. George was co-organizer of the 1999 ASB symposium on 'Coastal Ecology of Southeastern United States and edited the proceedings, published in the ASB *Bulletin*. Dr. George presently serves on the ASB conservation committee. He is co-organizer of the 2005 International Deep-sea Coral Symposium in November at the University of Miami.

Richard N. Henson – Dr. Henson is Professor of Biology and Associate Dean of Arts and Sciences at Appalachian State University, Boone, North Carolina. He earned the B.S. degree from Lamar University, Beaumont, Texas and the M.S. and Ph.D. degrees from Texas A&M University, College Station, Texas. His research interests include desert ecology, scorpion systematics and evolution. He is currently working on population differences and density of scorpions across large elevation ranges in the southwestern U.S. Dr. Henson has been an active member of ASB since 1993 and has served three years (one as chair) on the Research Awards Committee. He and his students have presented 17 papers at ASB in the past 14 years and he has directed 14 master's theses at ASU. Dr. Henson is a member of the Association of Southeastern Biologists, The American Entomological Society, The American Arachnological Society, The Southwestern Association of Parasitologists, The Southwestern Association of Naturalists and the Texas Academy of Science.

Dennis C. Haney – Dr. Haney is an Associate Professor of Biology at Furman University in Greenville, South Carolina. He received a B.A. in Biology at the University of California, San Diego, a M.S. in Zoology from Oregon State

University, and a Ph.D. in Zoology at the University of Florida (1996). Dr. Haney's research is in the area of environmental and comparative physiology. More specifically he is interested in the physiological responses of animals, especially fish, to environmental stressors. Since 1999 Dr. Haney has been involved in an NSF-REU funded interdisciplinary watershed research program at Furman University, the River Basins Research Initiative (RBRI), collaborating with colleagues in the Biology, Earth and Environmental Sciences, and Chemistry departments. His research within the RBRI has focused on studying the interactions between land use and water chemistry, and how these factors affect the distribution and physiology of local stream fish. He is a strong advocate of undergraduate research, helping to mentor well over 100 undergraduate students over the past 5 years as part of the RBRI. Dr. Haney's students have given numerous presentations at national and regional scientific conferences, many at the ASB annual meetings, and have been co-authors on a number of publications. Dr. Haney teaches courses in Animal Physiology, Human Physiology, Pathophysiology, Vertebrate Endocrinology, Biostatistics, and has led field courses in Florida, the Bahamas, Belize, Ecuador, and the Galápagos Islands. He is a member of the American Society of Ichthyologists and Herpetologists, the Society for Experimental Biology, the Society for Integrative and Comparative Biology, and the Southeastern Fishes Council. Dr. Haney has been a member of ASB since 1995, is the current chair of the Poster Awards Committee, and is currently serving on the Student Research Awards Committee.

Jennifer J. Davis – Dr. Davis is in her 29th year as a professor of biology at Shorter College in Rome, Georgia. She holds a B.A. in biology from Elmhurst College (1969), a M.S. in biology from Emory University (1971), and a Ph.D. in biology from Mississippi State University (1994). The mission of Shorter College is to provide excellent undergraduate education, so the emphasis of her professional career at Shorter has been teaching biology. While active biological research interests have been associated with cell biology and genetics, Jenny Davis considers herself to be a 'generalist' in biology because her undergraduate teaching requires a breadth of biological mastery. She has taught or teaches, general biology, zoology, genetics, cell biology, histology, developmental biology, physical science, science education, bioethics, and a course in biodiversity conservation. She has developed several courses including "Issues in Bioethics" and "Issues in Biodiversity Conservation", a course taught in conjunction with Shorter's study abroad/travel programs and suitable for non-biology majors. In recent years she has developed and participated in month-long study abroad trips to Europe (1997, 2001) and a month trip to Myanmar (Burma) and Thailand in 2003. In addition to teaching biology in study/travel contexts, her professional interests include science education issues; ethical issues concerning biodiversity conservation, genetics and biotechnology, and health and reproductive care; the history of science, particularly, the history of women in science; mentoring and encouraging young women and minorities to become scientists; and promoting undergraduate research. She is a member of AAAS, ASB, Georgia Academy of Science, and NSTA. She has served on the Ethics Committee of Floyd Medical Center, Rome Georgia since 2003.

Association of Southeastern Biologists

66th Annual Meeting April 13-16, 2005

University of North Alabama Florence, Alabama

The University of North Alabama and the entire Shoals area are excited about hosting the 66th Annual Meeting of ASB and would like to extend you a very warm welcome. The Shoals area has a rich music and recording history and has long been recognized as the “hit recording capital of the world.” Such greats as Elvis Presley, Hank Williams, the Rolling Stones, Lynard Skynard, and Jimmy Buffett, just to name a few, have recorded hit songs in our studios. Additionally, Florence is the birthplace of W. C. Handy, the “father of the blues,” and the Alabama Music Hall of Fame is located here in the Shoals. The Shoals area was the birthplace and home of Helen Keller, “America’s first lady of courage.” From her home, Ivy Green, she learned to read and teach Braille, then traveled throughout the world for the betterment of the deaf-blind and became the subject of the famed William Gibson’s play “The Miracle Worker.” The Shoals area also has much to offer from the natural wonders of the great Tennessee River and her many tributaries to museums, shops, and malls.

University of North Alabama

The University of North Alabama is a comprehensive regional state university offering undergraduate and graduate degrees, and serving the educational needs of students through all appropriate means of delivery. With enrollment exceeding 5,900 students, the University shares the broad purpose of all institutions of higher learning for the discovery, preservation, and transmission of knowledge through teaching, research, and public service. Within this broad purpose, the University recognizes an obligation of service to the people and the needs of the state and the region. The University occupies the beautiful campus of over 130 acres in a residential section of Florence, Alabama. Florence is located just north of the Tennessee River and is the largest city in a four-city area that includes Tuscumbia, Sheffield and Muscle Shoals. The entire metropolitan area has a combined population of approximately 140,000 people. The University of North Alabama, established in 1830 as LaGrange College, became in 1872 the first state-supported teachers’ college south of the Ohio River and one of the first coed colleges in the nation. The University of North Alabama has developed into a comprehensive regional university providing quality educational opportunities for students, with majors in four colleges—arts and sciences, business, education, and nursing and allied health. Graduate studies were introduced in 1957 with the establishment of master’s degree programs in education, and have been characterized by continued expansion: a sixth-year program in education

(1971), a master of business administration degree program (1975), a master of science in criminal justice degree program (1994), and a master of arts in English degree program (1999).

MEETING SITE

The meeting will be held at the **Shoals Conference Center** on the banks of the Tennessee River. The Conference Center offers first-class amenities and is the perfect location for the ASB Annual Meeting. The Conference Center offers a large, 500-capacity Ball Room for our Plenary Session on Wednesday evening and our Friday night Banquet. Additionally, there are eight rooms with capacities of 150 each and two rooms seating 50-60 each. The Shoals Conference Center has a lovely, high ceiling foyer where we will showcase our exhibitors. Spacious hallways allow ample room for poster presentations and a small preview room is located just off the main foyer. The Convention Center has plans to construct a large hotel on site, but unfortunately, no guarantee could be given that the facility would be completed by the time we hold our meeting.

Box lunches to eat at the Conference Center are available for \$7.00 to order with pre-registration. Otherwise, all lunches will generally be off site, but the Shoals Conference Center is located within three minutes of “restaurant row” where ASB members can find, burgers, steaks, Mexican, Italian, and awesome barbeque just to mention a few choice items.

LODGING

The Holiday Inn, Florence-Muscle Shoals-Sheffield will serve as the host hotel for the 2005 meeting and is located less than 15 minutes from the Convention Center. Rooms are \$60.00/night for up to 4 persons per room. There are a total of 204 rooms available at the Holiday Inn and they are expecting full booking Thursday and Friday nights so make your reservations early, but please mention that you are a part of the Association of Southeastern Biologists group convention. Although other nearby hotels typically charge higher rates, the Holiday Inn staff will be happy to book you in the nearby hotels for the same low rate should the Holiday Inn run out of rooms. They will contact you with directions and confirmation numbers for the outside booking.

Holiday Inn: 1-800-465-4329 or 1-256-381-4710.

REGISTRATION

	Pre-Registration (before March 15)	Late Registration (after March 15)
Regular Registration ^a	\$100.00	\$130.00
Student Registration ^{a,b}	\$ 60.00	\$ 85.00
Exhibitor with no booth ^a	\$130.00	\$150.00

^aDoes not include ASB membership dues. Membership application or renewal forms are available at www.asb.appstate.edu.

^bFaculty sponsor name and e-mail required.

Regular Thursday night ASB Barn Bust Social	\$30.00
Student Thursday night ASB Barn Bust Social	\$20.00
Regular Friday evening ASB Banquet*	\$25.00
(ASB Award winners <u>must be present</u> to receive award)	
Student Friday evening ASB Banquet*	\$15.00
(ASB Award winners <u>must be present</u> to receive award)	

All pre-registration will be done online by going to www.asb.appstate.edu and following the meeting links to registration. Members may pay using MC, VISA, AmEx, or Discover. Additionally, the form may be printed and mailed with a check if desired. Registration includes the Welcome Wine and Cheese Social prior to the Plenary Session and the Post-plenary Social following the talk, each with a cash bar. Red or white wine will be available to purchase at the banquet tables for \$20.00 per bottle.**

*Food cannot be brought into the Conference Center.

**Sorry, but only whole bottles available.

Florence Weather

Florence weather in April is unpredictable, so prepare for layers and rain. Temperatures will likely be in the low 70s to low 80s during the day, but may drop into the 50s at night.

TRANSPORTATION

The Holiday Inn Florence-Muscle Shoals-Sheffield is located on U.S Highway 43 at the Second Street intersection in Sheffield, AL. The Shoals Conference Center is located approximately 5 miles from the Holiday Inn just off Alabama Highway 133 in Florence. Shuttle service will be provided from the hotel to the Conference Center. There is also ample parking at the Conference Center for those who wish to drive from the hotel.

Coming from the west on U.S. 72 from Mississippi/Memphis: Follow US 72 east to the US 43 intersection and take US 43 north until you reach the Holiday Inn on the left just past Second Street. To reach the Conference Center, turn right onto Second Street and continue about 2 miles to AL 133 north and turn left. Continue across the Tennessee River following AL 133 north until you see signs for the conference center on the right.

Coming from the east on U.S. 72 from Huntsville: Follow US 72 west to AL 133 south and turn left. Stay on AL 133 until you see signs for the conference center on the left. Continue on AL 133 south across the Tennessee River until you reach Second Street and turn right. Stay on Second Street until you reach US 43 and turn right. The Holiday Inn will be on the left.

Coming from the east from the Huntsville airport: Follow I-565 south to I-65 north. Take I-65 north to US 72 west in Athens, AL. Follow US 72 west to AL 133 south and turn left. Stay on AL 133 until you see signs for the conference center on the left. Continue on AL 133 south across the Tennessee River until you

reach Second Street and turn right. Stay on Second Street until you reach US 43 and turn right. The Holiday Inn will be on the left.

Coming from the south from Birmingham or Birmingham airport: From the airport take Airport Boulevard from the airport to I-20 west/I-59 south. Take I-20 west/I-59 south to I-65 north. From airport or further south, take I-65 north to US 72 west in Athens. Follow US 72 west to AL 133 south and turn left. Stay on AL 133 until you see signs for the conference center on the left. Continue on AL 133 south across the Tennessee River until you reach Second Street and turn right. Stay on Second Street until you reach US 43 and turn right. The Holiday Inn will be on the left.

Coming from Nashville: Take I-65 south to the US 72 west exit in Athens. Follow US 72 west to AL 133 south and turn left. Stay on AL 133 until you see signs for the conference center on the left. Continue on AL 133 south across the Tennessee River until you reach Second Street and turn right. Stay on Second Street until you reach US 43 and turn right. The Holiday Inn will be on the left.

Coming from Muscle Shoals airport: Exit airport and turn right. Continue to Second Street (the end of the road) and turn left onto Second Street. Stay on Second Street until you reach US 43 and turn right. The Holiday Inn will be on the left. To reach the Conference Center, turn right onto Second Street and continue about 2 miles to AL 133 north and turn right. Continue across the Tennessee River following AL 133 north until you see signs for the Conference Center on the right.

ASB BARN BUST SOCIAL

The 2005 Thursday night ASB Social, dubbed the **ASB Barn Bust** promises to be outstanding. Needless to say, the name of the party reflects the nature and location of the event, so your best bet will be to include jeans and old shoes in your meeting wardrobe. The site location will remain undisclosed, so please, no driving to the event; we will provide buses to ferry members to and from the social. We plan to have a foot-stomping good time with live entertainment provided by a great local dance band called the **Midnighters** specializing in a great mix of 60's through today's rock and roll dance music. The evening's fare will feature the local specialty of southern fried catfish with all the trimmings of coleslaw, hushpuppies, and french fries along with boiled crawfish and/or shrimp with potatoes and corn all cooked up by a local favorite restaurant called *Cajun's Seafood*. Beverages for the evening will include iced tea and *plenty* of cold beer.

FRIDAY NIGHT BANQUET

We are in hopes of increasing our banquet attendance at this meeting, especially student attendance (those competing for awards should remember you must be present at the banquet to receive the award). In order to do so, we have arranged for an outstanding offering at an excellent price: \$25.00 for regular members and \$15.00 for students. The evening's event will be at the Shoals Conference Center Ball Room and will offer your choice of fillet mignon, chicken breast, or salmon fillet along with vegetables, roll, dessert, water, and iced tea.

Vegetarian meals can be provided upon request. Additionally, wine will be available for purchase at your table to have along with your meal should you so desire. Be sure and attend because you will not want to miss this excellent meal nor the hilarious Past-President’s Address by, then, Past President Andrew Ash.

EXHIBITORS/SPONSORS

If you are interested in exhibiting at the meeting and/or sponsoring meeting events, please contact Scott Jewell at A2ZConvention@Yahoo.com, or visit our website at www.asb.appstate.edu and follow the exhibitor information link. Space is limited so sign up early.

FIELD TRIPS

Cane Creek Canyon Nature Preserve

Time: 9:00 a.m. - 2:00 p.m.

Number of Participants: 20

Primary Field Trip Leader: Jim Lacefield, private landowner, biologist, geologist

Description of Site/Trip: Cane Creek Canyon Nature Preserve is a 413 acre, privately protected scenic natural area located in the Little Mountains region of Colbert County, Alabama. The rugged terrain provides a wide range of habitats and diverse natural communities. Ravines, waterfalls, bluffs, rock shelters, and giant boulders contribute to the scenic nature of the preserve. The area is noted for its abundance and diversity of spring wildflowers and high tree diversity (over 100 species). A number of rare plant species occur on the preserve including French’s shooting star.

Sipsey Wilderness, Bankhead National Forest

Time: 9:00 a.m. - 2:00 p.m.

Number of Participants: 16

Primary Field Trip Leaders: Paul Davison, UNA botanist; Rhonda Stewart (USDA Forest Service botanist from Bankhead National Forest)

Description of Site/Trip: The Sipsey Wilderness is noted for its deep ravines that provide microclimates that host disjunct plant populations typical of more northerly areas, including, for example, eastern hemlock, sweet birch, and many other species. The narrowly endemic and endangered flattened musk turtle inhabits local streams and the green salamander is at the southern end of its range. The ravines are noted for their waterfalls, bluffs, and remnant stands of old growth forest.

Prairie Grove Glade Nature Preserve

Time: 9:00 a.m. - 2:00 p.m.

Number of Participants: 16

Primary Field Trip Leaders: David Webb, TVA botanist

Description of Site/Trip: The Nature Conservancy has protected the last and largest remnant limestone cedar glade in its 191 acre Prairie Grove Glade Nature Preserve. The preserve was established to protect the cedar glade community with its many narrowly endemic plants. Some of the rare species include *Lesquerella lyrata*, lyrate bladderpod, a federally listed endangered species; *Leavenworthia alabamica*, Alabama glade cress; *Delphinium alabamicum*, Alabama larkspur; and *Eriogonum longifolium* var. *harperi*.

SPOUSE TOURS

The Florence/Lauderdale Tourism Office has arranged day trips for spouses attending the 2005 ASB meeting. All spouses are cordially invited to participate in the Renaissance City Spouse Tours. One tour each day will be conducted and spouses or any other interested parties may join either or both tours.

Day 1 Tour: Frank Lloyd Wright Rosenbaum House, W.C. Handy Home (the father of jazz), 1800's Pope's Tavern, Helen Keller Birthplace, and lunch at the Alabama Music Hall of Fame with entertainment by local recording artists. Day 1 menu includes L.O. Bishop Barbecue, chips, beans & drink. \$35.00.

Day 2 Tour: North Florence Village & Downtown Florence, shopping at antique stores, Old Time Hardware Store, unique ladies & men's apparel boutiques, Kennedy-Douglass Art Center exhibit, gourmet lunch at Eva Marie's Restaurant, and a haunted history walking tour of downtown Florence. Day 2 menu includes choice of 5 different Panini grill sandwiches, chips or salad, drink and dessert. \$27.50.

PROGRAM SUMMARY

All locations are at the Shoals Conference Center unless otherwise noted.

Activity	Time	Location
WEDNESDAY, APRIL 13		
Registration	12:00-9:00 PM	Lobby
ASB Executive Committee Meeting	1:00-6:00 PM	Sweetwater D
SABS Council Meeting	3:00-7:00 PM	Wheeler
Exhibitors Set Up	8:00 AM-12:00 PM	Ballroom
ASB Welcome Reception	6:00-7:00 PM	Ballroom
ASB Plenary Session	7:00-8:30 PM	Riverfront A & B
ASB Social	8:30-10:00 PM	Ballroom
THURSDAY, APRIL 14		
Registration	8:00 AM -5:00 PM	Lobby
Continental Breakfast	8:00-9:00 AM	Ballroom
ASB Past President's Breakfast	7:00-8:30 AM	Holiday Inn
Poster set up	7:00-8:00 AM	Ballroom

Authors at posters	8:00-9:00 AM	Ballroom
Coffee Break	10:00-10:30 AM	Ballroom
Posters left up	8:00 AM -5:00 PM	Ballroom
Exhibitors	8:00 AM -5:00 PM	Ballroom
Slide preview room	8:00 AM -5:00 PM	Sweetwater D

PAPER SESSIONS

Plant Ecology I	9:00 AM -12:00 PM	Patton
Herpetology I	9:00 AM -12:00 PM	O'Neal
Plant Systematics I	9:00 AM -12:00 PM	Riverfront A & B
Invertebrate Zoology	9:00 AM -12:00 PM	Sweetwater A
Ichthyology	9:00 AM -12:00 PM	Sweetwater B
Genetics, Cell & Molecular Biology	9:00 AM -12:00 PM	Sweetwater C

SWS Luncheon	12:15-1:30 PM	Holiday Inn
Lunch Break	12:00-1:30 PM	
Women, Minorities, and Persons with Disabilities Roundtable Discussion	12:00-1:00 PM	Wheeler

PAPER SESSIONS

Plant Ecology II	1:30-5:00 PM	Patton
Herpetology II	1:30-5:00 PM	O'Neal
Plant Systematics II	1:30-5:00 PM	Riverfront A & B
Aquatic Ecology	1:30-5:00 PM	Sweetwater A
Microbiology I	1:30-5:00 PM	Sweetwater B

Coffee Break	3:00-3:30 PM	Ballroom
Southeastern Fisheries Council Meeting	5:00-5:30 PM	Wheeler
ASB Social	7:00-12:00 PM	TBA

FRIDAY, APRIL 15

Registration	8:00 AM -12:00 PM	Lobby
Continental Breakfast	8:00-9:00 AM	Ballroom
Slide preview room	8:00 AM -5:00 PM	Sweetwater D
Authors at posters	8:00-9:00 AM	Ballroom
Posters left up	8:00 AM-12:00 PM	Ballroom
Exhibitors	8:00 AM-12:00 PM	Ballroom
SABS/BSA Brk	7:00-8:30 AM	Holiday Inn
BBB poster set up	7:00-8:00 AM	Ballroom
BBB Judges and Officers	8:30-11:30 AM	Wheeler
BBB Business	8:30-11:30 AM	Riverfront A & B

PAPER SESSIONS

Plant Ecology III	9:00-11:30 AM	Patton
Herpetology III	9:00-11:30 AM	O'Neal
Microbiology II/ Parasitology	9:00-11:30 AM	Sweetwater B
Plant Biology	9:00-11:30 AM	Sweetwater C
Education Symposium	8:45-11:30 AM	Sweetwater A
Coffee Break	10:00-10:30 AM	Ballroom
ASB Bus Meeting	11:30 AM-12 PM	Riverfront A & B
ESA Luncheon	12:15-1:30 PM	Holiday Inn
Exhibitor clean up	12:00 PM-3:00 PM	Ballroom
Poster take down	12:00 PM-3:00 PM	Ballroom
Slide Preview	Afternoon	Sweetwater D
Soc. of Herbarium Curators		
Executive Board Meeting	1:00-2:00 PM	Riverfront A & B
Soc. of Herbarium Curators Meeting	2:00-3:00 PM	Riverfront A & B
Herbarium Symposium	3:00-5:00 PM	Riverfront A & B

PAPER SESSIONS

Animal Ecology	1:30-4:15 PM	Patton
Teaching Biology	1:30-4:15 PM	Sweetwater C
BBB Session I	1:30-4:15 PM	Sweetwater A
BBB Session II	1:30-4:15 PM	Sweetwater B
BBB Session III	1:30-4:15 PM	O'Neal
Cocktail Hour	6:00-7:00 PM	Lobby
ASB Banquet	7:00-10:00 PM	Ballroom

SATURDAY, APRIL 16

ASB Executive Committee Meeting	8:00 AM-12:00 PM	Holiday Inn
Field Trips:		
Cane Creek Canyon Nature Preserve	9:00 AM-2:00 PM	
Sipsey Wilderness, Bankhead Nat'l Forest	9:00 AM-2:00 PM	
Prairie Grove Glade Nature Preserve	9:00 AM-2:00 PM	
Exhibitor Golf Outing*	9:00 AM-until	Robert Trent Jones Golf Trail

*Contact Scott Jewell to set up tee time: office (336) 421-0034; cell (336) 213-7373; e-mail a2zconvention@yahoo.com.



Exhibit Hall Hours ASB 2005 Convention Florence, Alabama 13-16 April 05

Wednesday, 13 April 05

<u>Time</u>	<u>Item/Status</u>	<u>Location</u>
8 AM-Noon	Exhibitor Installation	Ballroom
6 PM-7 PM	ASB Welcome Reception/Exhibits Open	Ballroom
7 PM-8:30 PM	Plenary Session/Exhibits Closed	Riverfront A & B
8:30 PM-10 PM	ASB Social/Exhibits Open	Ballroom

Thursday, 14 April 05

<u>Time</u>	<u>Item/Status</u>	<u>Location</u>
8 AM-5 PM	Exhibits Open	Ballroom
7 PM-Midnight	ASB Social (Guaranteed Good Food & Great Fun) (You will not want to miss this)	TBA-Transportation Provided

Friday, 15 April 05

<u>Time</u>	<u>Item/Status</u>	<u>Location</u>
8 AM-Noon	Exhibits Open	Ballroom
Noon-3 PM	Exhibitor Dismantle	Ballroom

Saturday, 16 April 05

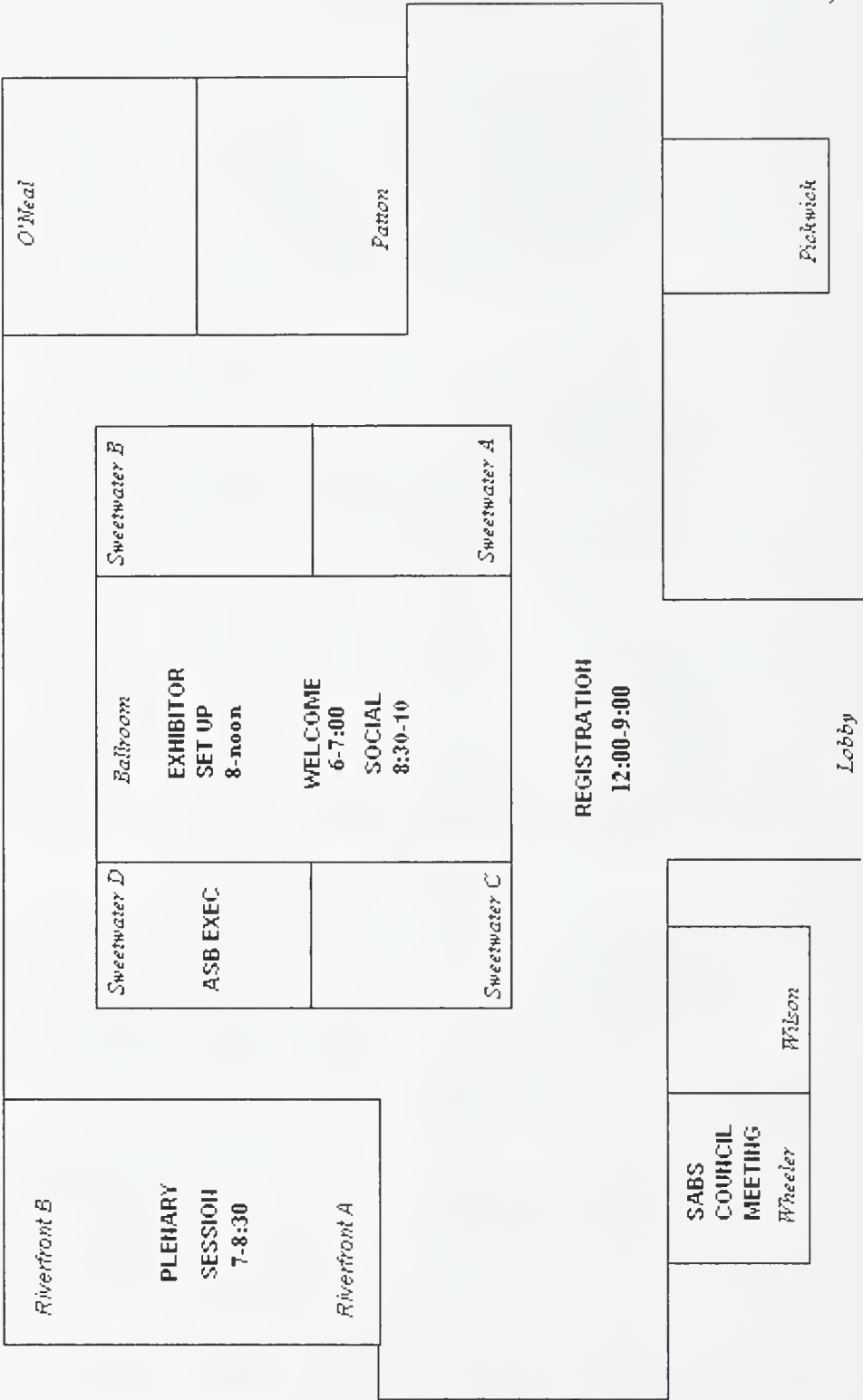
<u>Time</u>	<u>Item/Status</u>	<u>Location</u>
9 AM-until	*Exhibitor Golf Outing	Robert Trent Jones Golf Trail--A top 10 Golf Course in US

*Note: Contact Scott Jewell to set-up tee time--\$57/person (includes green fees, 18 holes, cart and clubhouse discounts). Limited space available--First come, First served.

Scott Jewell--ASB Convention Coordinator, (336) 421-0034 Office, (336) 213-7373 Cell; A2ZConvention@yahoo.com.

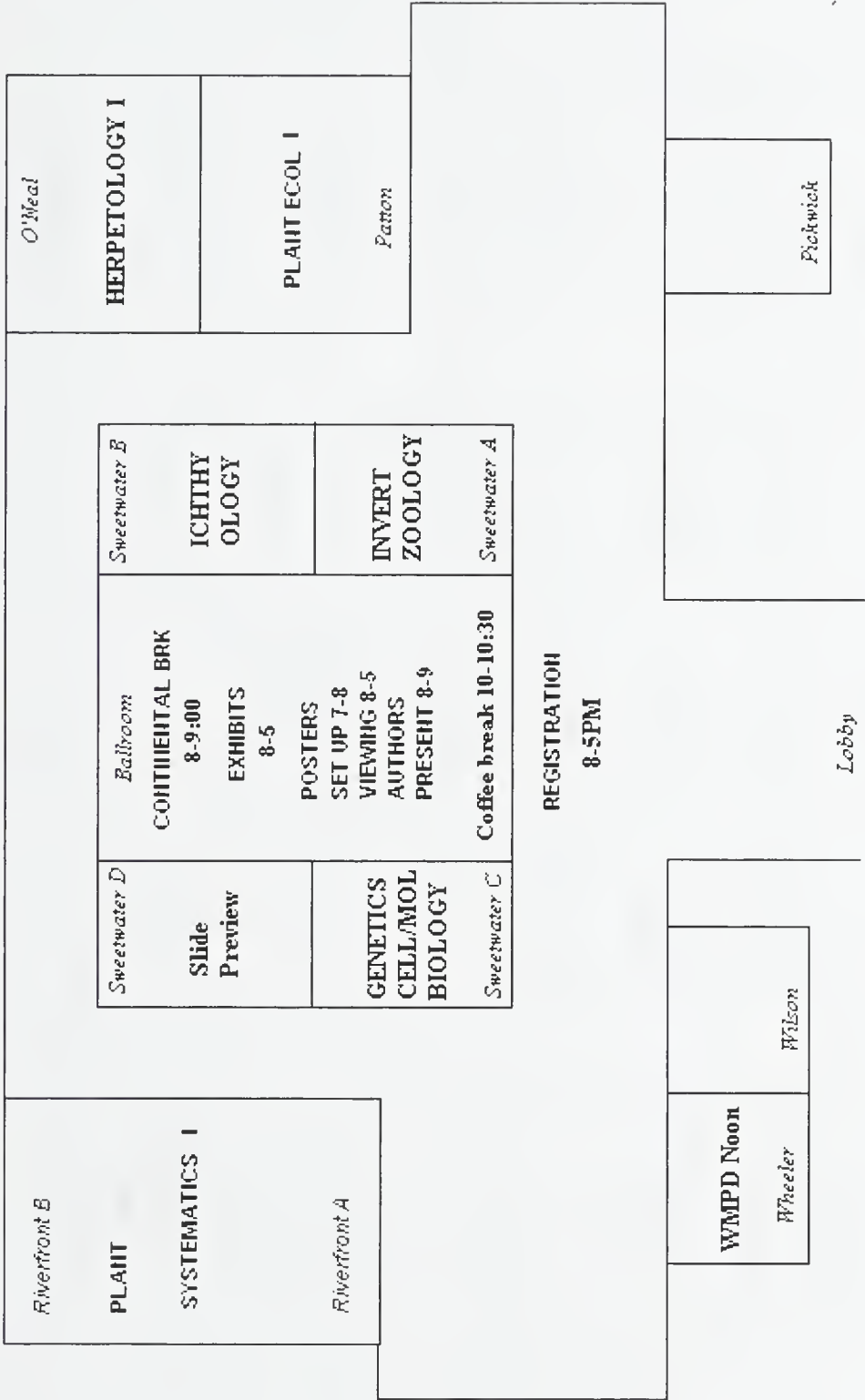
ASB 2005 MEETING
SHOALS CONFERENCE CENTER

WEDNESDAY
PM



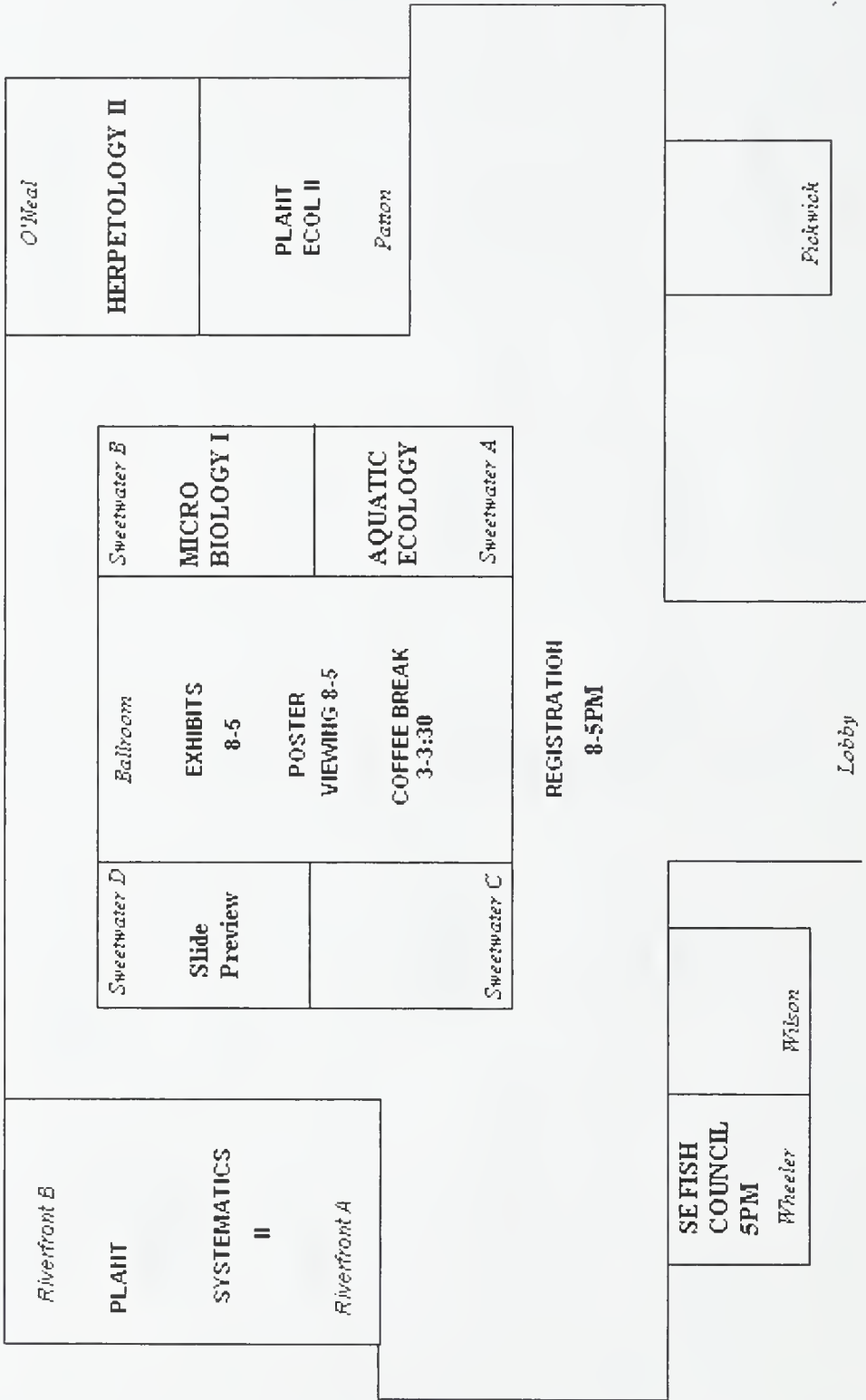
ASB 2005 MEETING
SHOALS CONFERENCE CENTER

THURSDAY
AM



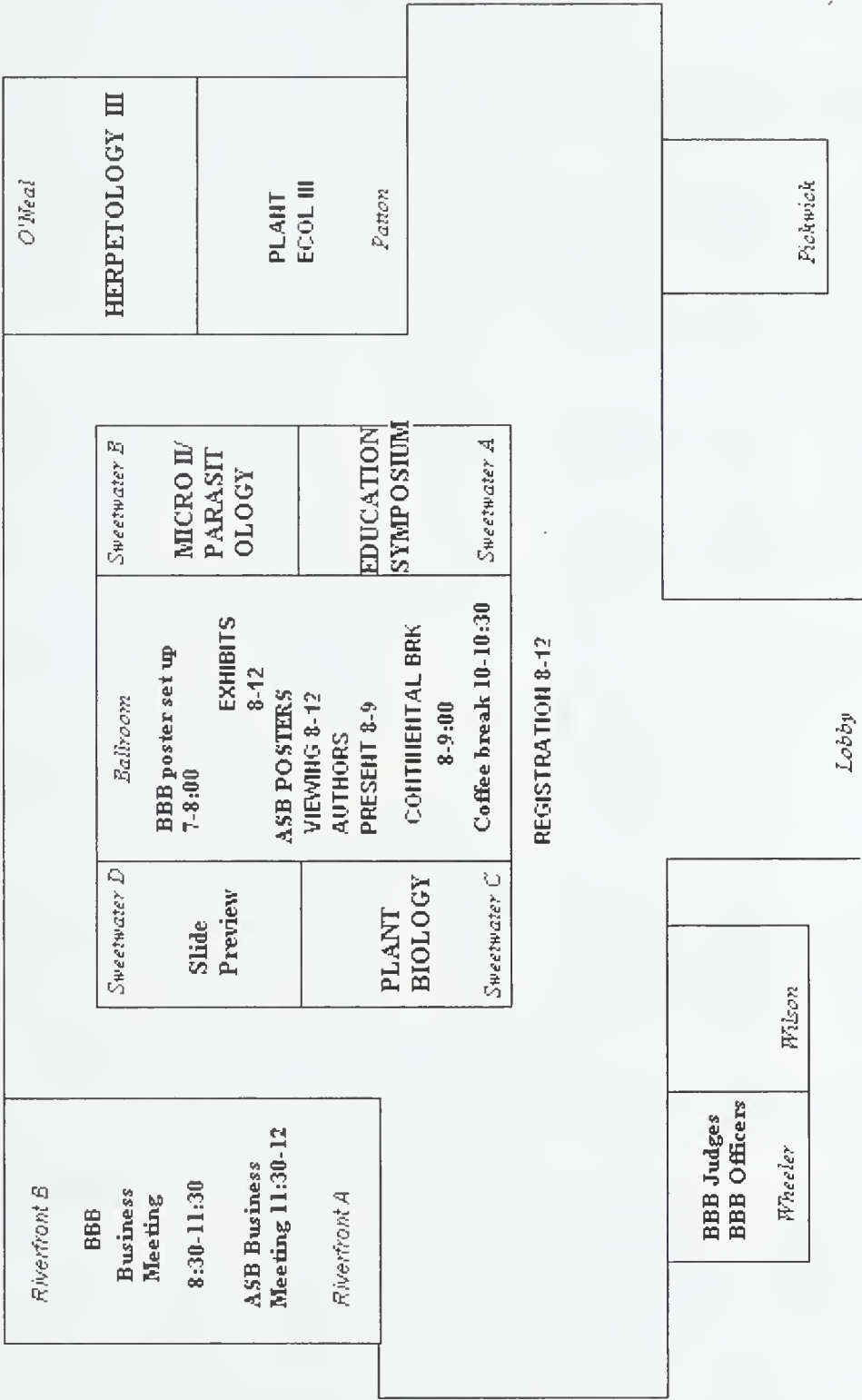
ASB 2005 MEETING
SHOALS CONFERENCE CENTER

THURSDAY
PM



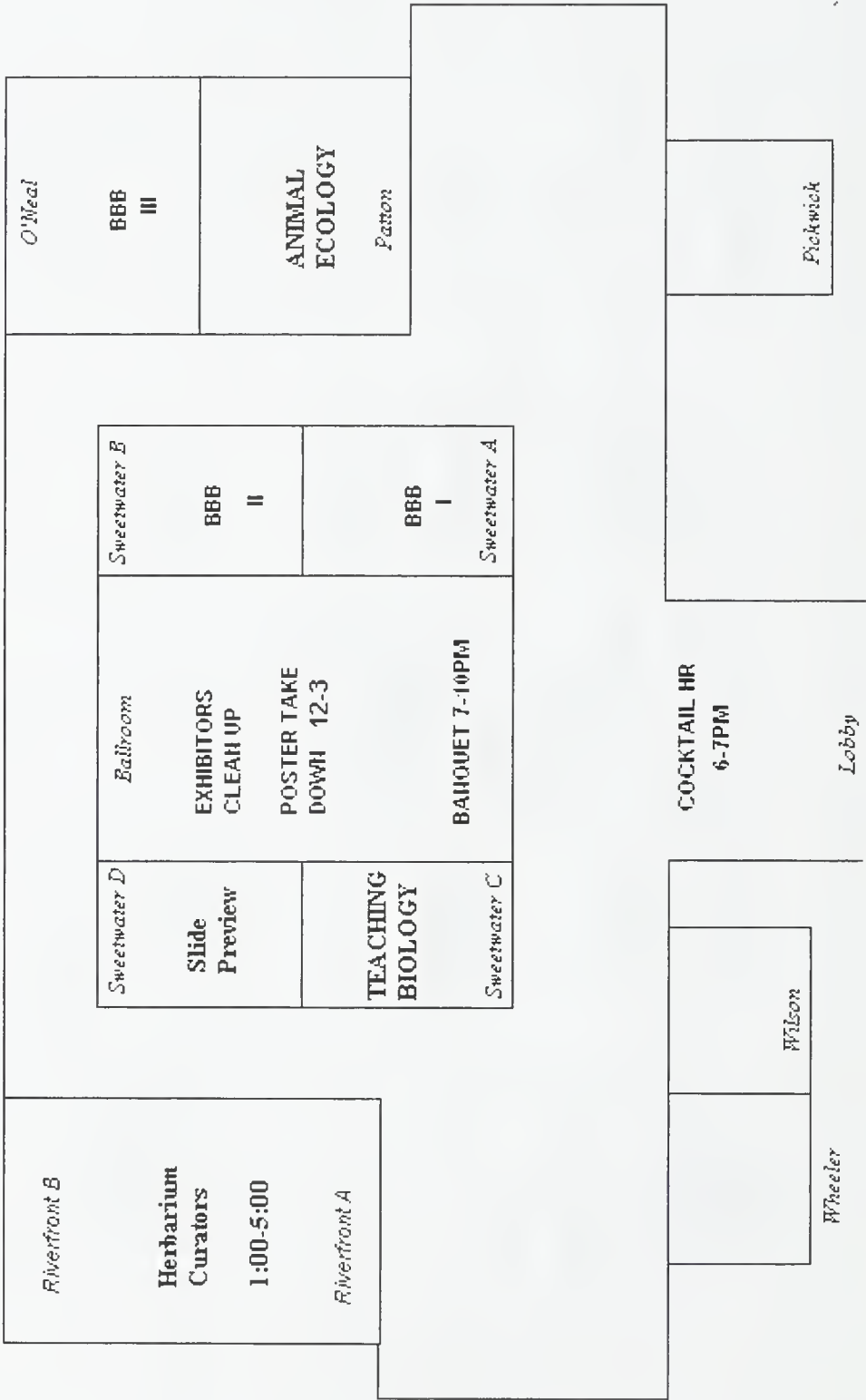
ASB 2005 MEETING
SHOALS CONFERENCE CENTER

FRIDAY
AM



ASB 2005 MEETING
SHOALS CONFERENCE CENTER

FRIDAY
PM



**LOCAL COMMITTEE ASSIGNMENTS
FOR THE ASB 66th ANNUAL MEETING
UNIVERSITY OF NORTH ALABAMA
FLORENCE, ALABAMA**

<i>Local Arrangements Chair:</i>	Terry D. Richardson	256-765-4429 tdrichardson@una.edu
<i>Program Subcommittee (Troy State University):</i>	Neil Billington	334-670-3943 askdrb@troyst.edu
	Stephen Landers	334-670-3661 slanders@troyst.edu
	Michael Woods	334-670-3403 mwoods@troyst.edu
<i>Web Coordinator:</i>	Thomas Haggerty	256-765-4432 tmhaggerty@una.edu
<i>Beta Beta Beta:</i>	Donald Roush	256-765-4435 dhroush@una.edu
<i>Commercial Exhibits:</i>	Scott Jewell	336-421-0034 a2zconvention@yahoo.com
	Terry Richardson	
<i>Workshops/Symposiums (Troy State University):</i>	Neil Billington	
	Stephen Landers	
	Michael Woods	
<i>Posters and Audiovisuals:</i>	Mary Ann Allan	256-765-4866 maallan@una.edu
	Evelyn Bruce	256-765-4933 ekbruce@una.edu
<i>Field Trips:</i>	Paul Kittle	256-765-4395 pdkittle@una.edu
<i>Registration/Meeting Statistics:</i>	Amy Crews-Oyen	256-765-4437 acoyen@una.edu
	Donald Roush	
<i>Social Events:</i>	Terry D. Richardson	
<i>Volunteers Coordinator:</i>	Donald Roush	
<i>Transportation/Parking/ Tourism:</i>	Terry D. Richardson	

AFFILIATE SOCIETIES MEETING WITH ASB IN APRIL 2005

HOST: THE UNIVERSITY OF NORTH ALABAMA

The following affiliate societies, **except the SE Division of ASIH**, will be in attendance at the 2005 Annual Meeting. We anticipate an excellent diversity of paper and poster presentations. The societies and their contacts are listed below.

American Society of Ichthyologists and Herpetologists
Southeastern Division

Dr. Michael E. Dorcas
 Assistant Professor of Biology
 Dept. of Biology, Davidson College
 Davidson, NC 28035-7118
 (704) 894-2727; Fax: (704) 894-2512
 e-mail: midorcas@davidson.edu
<http://www.bio.davidson.edu/dorcas>

Beta Beta Beta
Southeastern District I

Dr. Virginia Martin
 Queens College of Charlotte
 1900 Selwyn Avenue
 Charlotte, NC 28274
 (704) 337-2261
 e-mail: martin@rex.queens.edu

Beta Beta Beta
Southeastern District II

Donald H. Roush
 Dept. of Biology, Box 5181
 University of North Alabama
 Florence, AL 35632-0001
 (256) 765-4435
 e-mail: droush@unanova.una.edu

Botanical Society of America
Southeastern Division

Dr. Lytton John Musselman
 Mary Payne Hogan Professor of Botany and Chair
 Department of Biological Sciences
 110 Mills Godwin Building/45th St
 Old Dominion University
 Norfolk, Virginia 23529-0266
 (757) 683 3595; Fax: (757) 683 5283
 e-mail: lmusselm@odu.edu
<http://web.odu.edu/lmusselman>

Ecological Society of America
Southeastern Chapter

Dr. James O. Luken
 Dept. of Biology, P.O. Box 261954
 Coastal Carolina University
 Conway, SC 29528-6054
 (843) 349-2235; Fax: (843) 349-2201
 e-mail: JoLuken@coastal.edu

Society of Herbarium Curators

Dr. Michael Woods
 Dept. of Biol. & Environ. Sciences
 Troy University, Troy, AL 36082
 (334) 670-3403; Fax: (334) 670-3662
 e-mail: mwoods@troyst.edu
<http://spectrum.troyst.edu/~mwoods/>

Society of Wetland Scientists
South Atlantic Chapter

Dr. Steven J. Miller
 St Johns River Water Management
 District, P.O. Box 1429
 Palatka, FL 32178
 (386) 329-4387; Fax: (386) 329-4329
 e-mail: sjmiller@sjrwmd.com

Southeastern Fishes Council

Dr. Henry Bart
 Tulane Museum of Natural History
 Tulane University
 Belle Chasse, LA 70037
 (504) 394-1771; Fax: (504) 394-5045
 e-mail: hank@museum.tulane.edu

Southern Appalachian Botanical Society

Dr. Michael E. Held
 Dept. of Biology, Saint Peter's College
 Jersey City, NJ 07306
 (201) 915-9189; Fax: (201) 915-9191
 e-mail: MHSavanna@aol.com

SPECIAL REMINDERS FROM THE PRINT EDITOR

ASB BANQUET ATTENDANCE

Please keep in mind that recipients of ASB awards must be present at the annual ASB banquet to receive the award. Therefore, all applicants for ASB awards must attend the banquet to insure the presence of the winners.

EXTRA ABSTRACT SUBMISSION

Besides sending abstracts of papers and posters to the Program Committee by November 12, 2004, anyone wishing to be considered for an award must send an abstract to the respective award committee chairperson in order to be considered. Checking the box on the registration form for the award is not enough. An abstract must be sent to the chairperson by January 7, 2005.

INSTRUCTIONS FOR SUBMITTING ORAL PRESENTATIONS

All oral presentations will be done using Microsoft PowerPoint or MS PowerPoint-compatible software only. Presenters must bring backups consisting of one or two copies of disks (CDs) to the meeting. Moreover, 2x2 slide projectors will not be available. Anyone wishing to present using 2x2 slides must bring their own projector. Overhead projectors will be available for anyone bringing backup overheads.

FINAL SUBMISSION OF CD

Complete and final presentations must be submitted on CD by April 1. The first author's name and truncated title must be written on the upper surface of the CD using an indelible marker.

Submit the CD by the April 1st deadline to: ATTN: ASB 2005 Annual Meeting, c/o Dr. Terry D. Richardson, University of North Alabama, Box 5212, Florence, AL 35632-0001.

Plenary Speaker – Massimo Pigliucci



Dr. Pigliucci is Professor in the Department of Ecology & Evolution at SUNY-Stony Brook (Long Island, NY). His research is on the evolution of genotype-environment interactions and on the role of constraints in evolutionary biology. He also has an interest in epistemology and philosophy of science.

He received his Doctorate in Genetics at the University of Ferrara in Italy, his Ph.D. in Botany from the University of Connecticut, and a Ph.D. in Philosophy of Science at the University of Tennessee. He has published 65 technical papers and three books on evolutionary biology: *Phenotypic Evolution: a Reaction Norm Perspective* (with Carl Schlichting, Sinauer, 1998); *Phenotypic Plasticity: Beyond Nature and Nurture* (Johns Hopkins University Press, 2001); and *Phenotypic Integration: the Evolution of Complex Phenotypes* (co-edited with Katherine Preston for Oxford University Press, 2004). He has also published two books for the general public: *Tales of the Rational: Skeptical Essays about Nature and Science* (Freethought Press, 2000), and *Denying Evolution: Creationism, Scientism, and the Nature of Science* (Sinauer, 2002). His forthcoming book (with philosopher Jonathan Kaplan) is *Making Sense of Evolution: Toward a Coherent Picture of Evolutionary Theory* (Chicago Press).

Dr. Pigliucci has won the Dobzhansky Prize from the Society for the Study of Evolution, of which he is now Executive Vice President. In 2004 he has been elected fellow of the American Association for the Advancement of Science "for fundamental studies of genotype by environmental interactions and for public defense of evolutionary biology from pseudoscientific attack." He has been an Associate Editor of the *Journal of Evolutionary Biology*. He can be reached via email at pigliucci@genotypebyenvironment.org, or on the web at www.genotypebyenvironment.org.

Selected recent publications:

- Kaplan, J, and Pigliucci, M (2004). On the concept of biological race and its applicability to humans. *Philosophy of Science* **70**: 1161-1172.
- Pigliucci, M, and Schmitt, J (2004). Phenotypic plasticity in response to foliar and neutral shade in gibberellin mutants of *Arabidopsis thaliana*. *Evolutionary Ecology Research* **6**: 243-259.
- Pigliucci, M (2003). Selection in a model system: ecological genetics of flowering time in *Arabidopsis thaliana*. *Ecology* **84**: 1700-1712.
- Pigliucci, M (2003). Species as family resemblance concepts: the (dis-)solution of the species problem? *BioEssays* **25**: 596-602.
- Pigliucci, M, and Murren, C (2003). Genetic assimilation and a possible evolutionary paradox: can macroevolution sometimes be so fast as to pass us by? *Evolution* **57**: 1455-1464.
- Pigliucci, M, Pollard, H, and Cruzan, M (2003). Comparative studies of evolutionary responses to light environments in *Arabidopsis*. *American Naturalist* **161**: 68-82.

OR



Front of the Shoals Conference Center

ASB EDUCATION COMMITTEE SYMPOSIUM

Teaching Evolution and the Challenge of Intelligent Design

At the annual meeting Friday morning, April 15, 2005, the A.S.B. Education Committee will present a symposium on "Teaching Evolution and the Challenge of Intelligent Design," arranged and moderated by John V. Aliff, Editor of the Georgia Journal of Science. The symposium will address Intelligent Design as a political movement, the scientific and philosophical problems with I.D. ideology, the Kansas State Board of Education science teaching standards controversy, and the teaching of science as scientism—an approach that rejects metaphysical, philosophical, and religious explanations because they cannot be confirmed by science.

Participants



Barbara Carroll Forrest earned a B.A. in English at Southeastern Louisiana University, an M.A. from L.S.U., and a Ph.D. in philosophy from Tulane U. Dr. Forrest is professor of philosophy at Southeastern Louisiana U. Her recent scholarly publications include: *The Possibility of Meaning in Human Evolution*, *Zygon: Journal of Religion and Science*, December 2000; and *Creationism's Trojan Horse: The Wedge of Intelligent Design*, with Paul R. Gross, Oxford University Press, 2004. Dr. Forrest is especially interested in intelligent design as a religious and a political movement.

Institution: Southeastern Louisiana University, Department of Philosophy

Phone: 985-549-5097; **Fax:** 985-549-2012

E-mail: bforrest@selu.edu



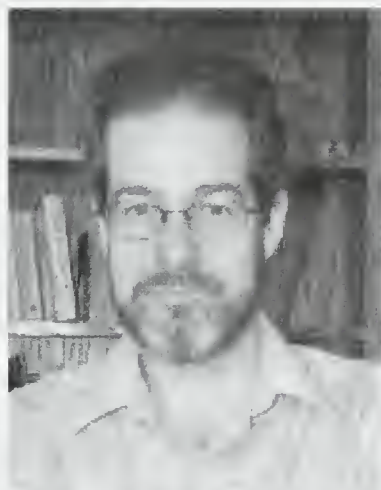
Taner Edis, assistant professor of physics at Truman State U., MO., and guest researcher at Lawrence Livermore National Lab., completed his undergraduate work at Bogaziçi U. in Turkey where he was born, and received his Ph.D. in physics from Johns Hopkins U. His research interests include atmospheric modeling and the philosophy of machine intelligence. His first book, *The Ghost in the Universe: God in Light of Modern Science*, an accessible defense of a naturalistic view of the world, Prometheus Books, for which he received the Morris D. Forkosch Award in 2002. Recently, with Matt Young, he co-edited *Why Intelligent Design Fails: A Scientific Critique of the*

New Creationism, Rutgers University Press, 2004.

Institution: Truman State University, MO, Department of Physics

Phone: 660-785-4583, **Fax:** 660-785-7604

E-mail: edis@truman.edu



Massimo Pigliucci is an Italian citizen, who has a Master's degree in Biological Sciences from the U. of Rome, a doctorate in genetics from the U. of Ferrara, and a Ph.D. in botany from the U. of Connecticut. He was formerly associate professor of Ecology and Evolution at the U. of Tennessee. He is now at S.U.N.Y., Stony Brook. Dr. Pigliucci's book, *Denying Evolution: Creationism, Scientism and the Nature of Science*, Sinauer, 2002, examines the evolution-creation movement by dividing the blame for the controversy equally among anti-intellectual creationists and scientists teaching scientism.

Institution: SUNY Stony Brook, Department of Ecology and Evolution

Phone: 631-632-1097; Fax: 631-632-7626

E-mail: pigliucci@rationallyspeaking.org



Keith Miller is a research assistant professor of geology at Kansas State University. He was educated at Franklin & Marshall College (B.S.), S.U.N.Y., Binghamton (M.S.) and the U. of Rochester (Ph.D. in geology). He is editor of the book, *Perspectives on an Evolving Creation*, Eerdmans Publishing Co., 2003, that sets forth moderate positions on the subject of science and religion. His research interests include paleoecology and the geological record of global climate and environmental change. Dr. Miller has been a leader in the scientific response to the

controversy over proposed standards for teaching science education in Kansas that removed the theory of evolution and references to a scientifically determined age of the Earth.

Institution: Kansas State University, Department of Geology

Phone: 785-532-2250; Fax: 785-532-5159

E-mail: kbmiller@ksu.edu

Symposium Schedule and Abstracts

8:45 AM

Introduction. John V. Aliff, Chair of the ASB Education Committee

Questions will be reserved for the panel discussion at 11:15 AM.

9:00 AM

PIGLIUCCI, MASSIMO. SUNY-Stony Brook--Is evolution a logical fallacy?

The neo-Darwinian theory of evolution is the currently accepted paradigm to explain the history and diversity of life on earth. Yet, ever since the publication of

Darwin's *Origin of Species* it has been under attack on a variety of grounds. Some of these criticisms have been put forth in the philosophical arena, where evolutionary theory has often been accused of being incoherent or logically fallacious. I will examine some of the most common accusations of logical inconsistency in the theory, showing why they are unjustified, and in the process attempting to explain more clearly what evolution is all about.

9:30 AM

FORREST, BARBARA. Southeastern Louisiana University—Inside Creationism's Trojan Horse: A Closer Look at Intelligent Design.

Intelligent design creationists at the Discovery Institute's Center for Science and Culture present themselves as scientists and scholars concerned with good science and science education. Promoting "intelligent design theory" as a "full-scale scientific revolution," they claim to be on the cutting edge of new scientific research. Contrary to these claims, however, intelligent design is merely the newest evolutionary variant of traditional American creationism. "ID" creationists have made no original contributions to science to support their contention that the purposeful activity of a supernatural designer explains biological phenomena better than natural processes. This is not their true aim. Rather, the movement's leaders are motivated by a desire to translate personal religious preferences into public policy, and they are making steady progress toward this goal. Fewer than a dozen states currently remain exempt from their attempts to influence either science standards, curricula, or textbooks. When approaching school boards and state boards of education, they disguise their creationist agenda with seemingly innocuous terminology that they coopt from legitimate scientific and educational discourse. Lucratively funded by sympathetic benefactors, ID creationists work through a well established network of local, state, and national religious organizations and religious/political operatives. Their political connections include members of Congress and close presidential advisors. The changes they hope to bring about in American public policy reflect their religious exclusionism and anti-secularism. If they succeed in advancing their vision of American culture and politics, serious damage will be done both to science education and to church and state separation.

10:00 AM

Break

10:15 AM

EDIS, TANER. Truman State University—Chance and necessity—and intelligent design?

The "intelligent design" (ID) movement's core concern is not biology—it is establishing intelligence as a separate principle alongside chance and necessity. Functional complexity is, ID proponents think, the signature of intelligence, and intelligence cannot be a product of mere physical processes. They attack Darwinian evolution because it is the best developed and most critical element in

naturalistic explanations of creative novelty. Scientifically, ID fails, not only because evolutionary biology remains a robustly productive and progressive enterprise, but also because Darwinian evolution has taken root outside of biology. Wherever physicists, cognitive scientists, and computer scientists seek to explain creativity and complexity within the natural world, Darwinian ideas appear. Recent research gives us strong reasons to think intelligent design is reducible to chance and necessity, and that broadly Darwinian processes are vital to creativity in general. ID, therefore, is a complete scientific non-starter.

10:45 AM

MILLER, KEITH B. Kansas State University—Countering public misperceptions of evolutionary science.

Challenges to modern evolutionary science are often rooted in fundamental misperceptions of the nature of science itself. Among the public, there is a widespread perception that the focus of science on natural cause-and-effect explanations is a thinly disguised effort to promote a godless worldview, rather than an inherent methodological limitation. Furthermore, theories are commonly viewed as merely unsubstantiated guesses, rather than as the unifying concepts that give our observations coherence and meaning. Theories within the historical sciences, in particular, are seen as being inherently untestable. Science for many is simply an encyclopedic accumulation of unchanging observational “fact.” The dynamic nature of science with the continual revision of theoretical constructs becomes evidence of the fleeting validity of scientific “truth.” Much of the critique of evolutionary theory is also predicated on completely false views of its theoretical content and observational foundation. For example, the common charge that the fossil record lacks the required transitional or intermediate forms is based on erroneous views of the nature of the fossil record, the manner in which species are classified, and the expectations of evolutionary theory. There is little public understanding of the diverse range of observational data from the fossil record, biogeography, comparative anatomy, developmental biology, genetics, and molecular biology that makes sense only in the context of common descent. Too often the grand patterns of nature become obscured in public debate. The future of scientific literacy will depend on how we respond to these misperceptions as scientists and educators.

11:15 AM

Panel Discussion

Questions are invited from the audience after brief interchanges among the participants.



COMMITTEE ON WOMEN, MINORITIES AND PERSONS WITH DISABILITIES**Increasing Minority Participation in ASB
A Roundtable Discussion**

The Committee on Women, Minorities and Persons with Disabilities is sponsoring a lunchtime roundtable discussion on increasing minority participation in ASB. The session will be at noon on Thursday in the Wheeler Room and box lunches will be provided for participants. The Committee and some ASB members from minority institutions presently involved in ASB will act as a panel to get the discussion going. The goal is to come up with a list of possible actions ASB could initiate to bring more minority institutions into the membership. Please register on the meeting registration form—we have lunches for up to forty participants.

**NEW ASB AFFILIATE****The Society of Herbarium Curators**

For the past decade, the Herbarium Curator's Committee, a group of herbarium curators in southeastern United States has been informally meeting with the Association of Southeastern Biologists. The group organized a symposium entitled "The Future of Plant Collections in the Southeast" in 2001 and the concept for the expansion of this organization was developed in the ensuing workshop. Through the spearheading efforts of John Herr at the University of South Carolina, Michael Woods at Troy University, and Dan Evans at Marshall University, the group developed a constitution and formally organized as The Society of Herbarium Curators (TSHC) on July 4, 2004. TSHC has been recognized as an affiliate society by ASB and SABS. The group is currently developing a network of collections and botanical expertise in the region, and they plan to use the network to obtain funding to completely database the herbaria of the Southeast by the year 2015. TSHC will use the network and shared data and expertise to provide botanical training to the region. In particular, they will use their network to reach out to groups that have been historically underrepresented in the botanical and conservation communities, to land managers and state and federal agencies, and to the K-12 students and teachers. TSHC will work to support herbaria of all types in the region, to help develop community standards of curation, and to make certain that herbaria are fully utilized and not orphaned by their institution. The Southeast is known as a botanically diverse region and the rate of species description indicates that the region is still providing botanical surprises. The Society of Herbarium Curators is committed to making this rich natural history available to the global scientific community and will work to broaden our scientific knowledge of this amazing region of the earth.



SD-ASIH ANNOUNCEMENT RETRACTION

The Southeast Division of ASIH (SD-ASIH) is meeting with its parent society (ASIH) at the joint Herpetology-Ichthyology meetings in Tampa this summer, rather than at the 2005 ASB meetings in Florence AL. Therefore, contrary to what was printed in Southeastern Biology (page 327, Vol. 512, Number 3), there will be no SD-ASIH student travel or student paper awards presented at the ASB meetings during 2005.



QUILLCON II SYMPOSIUM FOR 2005

Symposium has been cancelled.



Symposium sponsored by The Society of Herbarium Curators

Building the SouthEast Network of Expertise and Collections (SERNEC)

Two talks (15 minutes each)

1. Zack Murrell. Appalachian State University. Building a regional network of collections and expertise: summary and needs.
2. TBA. National Biological Information Infrastructure/Southern Appalachian Information Network. The DIGIR toolkit: Making collections available on the WWW.

Breakout work session.

(30 minutes) Curators from each state will meet and discuss needs and goals. This information will be compiled and presented to the group.

(30 minutes) State representatives will present group information.

Discussion

15 minutes

Summary talk (15 minutes)

Zack Murrell. Where we are and where we are going.



ASB PAPER AND POSTER SESSIONS

ASB PAPER SESSIONS

THURSDAY, APRIL 14, 2005

THURSDAY MORNING SYMPOSIA

Plant Systematics I Riverfront A and B

Presiding: Michael Woods, Troy University

- 9:00 1 JONES, RONALD L. Eastern Kentucky University—Current concepts for classification of the traditional family “Liliaceae,” with a treatment for Kentucky.
- 9:15 2 JONES, RONALD L. Eastern Kentucky University—Recognition of segregate genera in the Asteraceae of Kentucky.
- 9:30 3 TUCK, SHELLEY N. AND MICHAEL WOODS. Troy University—A distributional and taxonomic study of the genus *Ipomoea* (Convolvulaceae) in Alabama.
- 9:45 4 WINDHAM, THOMAS L., MICHAEL WOODS AND ALVIN R. DIAMOND, JR. Troy University—The fern and fern allies of Southeast Alabama.
- 10:00-10:30 COFFEE BREAK
- 10:30 5 GADDY, L. L.¹ AND JOHN B. NELSON². terra incognita, inc¹ and University of South Carolina²—Vascular plant inventory of Congaree National Park.
- 10:45 6 BARRON, JENNIFER, GINA CHILDERS, MICHELLE CLIFTON AND MICHAEL WAYNE MORRIS. North Georgia College & State University—A preliminary survey of the vascular flora of Ramblewood, Lumpkin County, Georgia.
- 11:00 7 STALTER, R. AND ERIC E. LAMONT. St. John’s University, New York Botanical Garden—The vascular flora of Great Gull Island, New York.
- 11:15 8 COX, PATRICIA B.¹ AND ALAN S. WEAKLEY². Tennessee Valley Authority¹ and University of North Carolina Herbarium²—*Bupleurum gerardii* All. (Apiaceae), a new “weed” in Tennessee.
- 11:30 9 WILLIAMS, CHARLIE¹, ELIANE M. NORMAN² AND GERARD G. AYMONIN³. André Michaux International Society¹, Stetson

University² and Muséum National d'Histoire Naturelle, Paris³—The type locality of *Shortia galacifolia* visited once again.

- 11:45
- 10
- HADDEN, CARRIE B., JOHN M. HERR, JR. AND JOHN B. NELSON. University of South Carolina—Status and evaluation of the Herbarium of Henry W. Ravenel (1814-1887).

Genetics, Cell and Molecular Biology

Sweetwater C

Presiding: Christi Magrath, Troy University

- 9:00
- 11
- SEYMER, JENNIFER AND DWAYNE WISE. Mississippi State University—Microtubule turnover and chromosome stretching in cockroach spermatocytes.
- 9:15
- 12
- CARIVEAU, MICKAEL J., GERHARD KALMUS, RON ALLISON AND ROBERTA JOHNKE. East Carolina University—Cyclin dependent mitotic delay is correlated with DNA double strand break formation in the x-irradiated NIH3T3 fibroblast.
- 9:30
- 13
- DIEHL, WALTER J. AND J. DEE PERKINS. Mississippi State University—Patterns of natural selection in the genome of Mycoplasmatales depend on gene function.
- 9:45
- 14
- AYALA, JANINY AND CHRISTI MAGRATH. Troy University—Replication from a transcription termination deficient ARS element.
- 10:00-10:30
- COFFEE BREAK
- 10:30
- 15
- ROE, KEVIN J.¹ AND BERNARD R. KUHAJDA ². Delaware Museum of Natural History¹ and University of Alabama²—Conservation genetics and molecular systematics of the endangered Alabama Cave Shrimp (*Palaemonias alabamae*) (Decapoda: Atyidae) and a new species of cave shrimp in northwestern Alabama.
- 10:45
- 16
- JACOB, NITYA P.¹ AND L. MARK LAGRIMINI². Oxford College of Emory University¹ and Syngenta Biotechnology Inc.²—Comparative analysis of anionic peroxidase gene expression in *Nicotiana tomentosiformis* and in the allotetraploid *Nicotiana tabacum*.
- 11:00
- 17
- JIANG, CHEN¹, GLENN M. COHEN¹ AND ERIC G. SPOKAS². Troy University¹ and Rowan University²—Distribution patterns and cellular localization of alkaline phosphatase in zebrafish and mosquitofish gills.

- 11:15 18 **ROGERS-LOWERY, CONSTANCE L. AND RONALD V. DIMOCK, JR.** Wake Forest University—Changes in protease activity of fish skin mucus during development of acquired resistance to larvae of freshwater mussels.
- 11:30 19 **RAYBURN, JAMES R., GALA L. BYNUM, GEORGE R. CLINE, FRANK A. ROMANO III AND MIJITABA HAMMISSOU.** Jacksonville State University—Sperm morphology of the freshwater jellyfish *Craspedacusta sowerbyi*.

Ichthyology Sweetwater B

Presiding: Judith Shardo, Middle Tennessee State University

- 9:00 20 **FISCHER, ROBERT U.** Eastern Illinois University—Changes in bluegill life history in response to 35 years of thermal extremes.
- 9:15 21 **WOODALL, AMY, KEVIN BUTLER AND BRUCE STALLSMITH.** University of Alabama at Huntsville—Timing of reproductive effort in two shiner species, *Notropis asperifrons* and *N. stilbius*, in Alabama
- 9:30 22 **KOIGI, RACHAEL N.¹, NEIL BILLINGTON¹ AND WILLIAM GARDNER².** Troy University¹ and Montana Department of Fish, Wildlife and Parks²—Conservation genetics of Montana sauger.
- 9:45 23 **CREECH, RONALD E.¹, RON E. JENSEN², P. TAYLOR EZELL¹, NEIL BILLINGTON¹, JANET GASTON¹ AND TANYA J. JOHNSTON².** Troy University¹ and Saskatchewan Environment²—Hybridization and introgression between sauger and walleye in Lake Diefenbaker, Saskatchewan, Canada.
- 10:00-10:30 **COFFEE BREAK**
- 10:30 24 **BLANCHARD, TOM, THOMAS PRATT, SHINGO EINAGA AND CHASE TAYLOR.** University of Tennessee at Martin—Seasonal and annual differences in a fish assemblage within a flooded forest at Reelfoot Lake, TN.
- 10:45 25 **MOYER, GREGORY R.¹, BRIAN L. SLOSS², IGOR MITROFANOV³, CAREY KRAJEWSKI⁴ AND NEIL BILLINGTON⁵.** Oregon State University¹, University of Wisconsin-Stevens Point², Zoology Institute of Almaty Kazakhstan³, Southern Illinois University⁴, and Troy University⁵—Phylogenetic relationships among *Perca* species inferred from mitochondrial DNA sequence data.

- 11:15 26 **SLOSS, BRIAN L.¹, NEIL BILLINGTON² AND BROOKS M. BURR³.** University of Wisconsin-Stevens Point¹, Troy University², and Southern Illinois University³—A molecular phylogeny of Etheostomatinae (Teleostei, Percidae) based on combined cytochrome *b* and 12S ribosomal RNA mitochondrial DNA sequence variation.
- 11:30 27 **SHARDO, JUDITH D.** Middle Tennessee State University—Neurulation in teleost fishes: a derived character.

Invertebrate Zoology
Sweetwater A

Presiding: Ronald Dimock, Wake Forest University

- 9:00 28 **HARRELSON, LANE AND STEPHEN C. LANDERS.** Troy University—Protozoan parasites of the maldanid polychaete *Axiiothella mucosa*.
- 9:15 29 **AL-ZEIN, MOHAMMAD S.¹ AND KHOUZAMA M. KNIO².** Old Dominion University¹, American University of Beirut²—Comparative morphometric studies of the cryptic and sympatric flower head-infesting tephritids, *Chaetostomella cylindrica* (Robineau-Desvoidy) and *C. lurida* (Loew).
- 9:30 30 **CHANNELL, KATHERINE AND THOMAS G. JONES.** Marshall University—Implementation of a spatial-temporal focus to predict habitat locations and distribution of *Cambarus veteranus*.
- 9:45 31 **SWECKER, CASEY AND THOMAS G. JONES.** Marshall University—Crayfish Distribution of the New River Gorge National River.
- 10:00-10:30 **COFFEE BREAK**
- 10:30 32 **DIMOCK, RONALD V., JR.¹ AND DAVID C. ALDRIDGE².** Wake Forest University¹ and University of Cambridge² —Something is very fishy about these mussels: the symbiosis of European bitterling and their unionid hosts.
- 10:45 33 **RICHARDS, BRIAN K., JOSHUA WESTBROOK, THOMAS G. JONES AND RALPH W. TAYLOR.** Marshall University—Determining status and trends of the New River mussel community, New River Gorge National River, WV.
- 11:00 34 **HANNA, CHADWICK J. AND VINCENT A. COBB.** Middle Tennessee State University—Thermal effects on green lynx spider egg sacs and hatching.

- 11:15 35 **SNYDER, JOHN.** Furman University—A checklist and database describing South Carolina moth species.
- 11:30 36 **FIELDS, CHRIS AND RODNEY BEASLEY.** New Site High School, New Site, MS—First record of *Sphodros rufipes* from northern Mississippi.

Herpetology I

O'Neal

Presiding: Thomas K. Pauley, Marshall University

- 9:00 37 **GREEN, J. JEFFREY AND VINCENT A. COBB.** Middle Tennessee State University—Body temperature selection of black racers (*Coluber constrictor*) in Middle Tennessee.
- 9:15 38 **LOUGHMAN, ZACHARY J. AND THOMAS K. PAULEY.** Marshall University—Snake Community Dynamics of a Reclaimed Mine Land in Southern West Virginia.
- 9:30 39 **WILLSON, JOHN D.¹, CHRISTOPHER T. WINNE¹, MICHAEL E. DORCAS² AND J. WHITFIELD GIBBONS¹.** Savannah River Ecology Laboratory¹ and Davidson College²—Post-drought responses of semi-aquatic snakes inhabiting an isolated wetland: Insights on different strategies for persisting in a dynamic habitat.
- 9:45 40 **WINNE, CHRISTOPHER T. AND J. WHITFIELD GIBBONS.** University of Georgia's Savannah River Ecology Laboratory—Adaptations of a small aquatic snake (*Seminatrix pygaea*) to a dynamic habitat: selection on body size and reproduction after aestivating during drought.
- 10:00-10:30 **COFFEE BREAK**
- 10:30 41 **SMITH, DANNA AND CARL QUALLS.** University of Southern Mississippi—Habitat associations of herpetofaunal sandhill communities in southern Mississippi.
- 10:45 42 **FOGUS, TERESA M.¹, ZACHARY LOUGHMAN¹, JAIME SIAS¹, S. DOUGLAS KAYLOR¹, MARK B. WATSON² AND THOMAS K. PAULEY¹.** Marshall University¹ and the University of Charleston²—Amphibian and reptile inventories of the Gauley River National Recreation Area.
- 11:00 43 **RYAN, BUCKY AND TRAVIS PERRY.** Furman University—Comparing reptile and amphibian communities between two forest types using large and small coverboards.

- 11:1544MERRITT, DEBORAH¹, THOMAS PAULEY¹, JOHN MAERZ² AND JAMES KOCHENDERFER³. Marshall University¹, Cornell University² and US Forest Service³—Amphibian use of man-made pools in clear-cut forests.
- 11:3045ROTHERMEL, BETSIE B., THOMAS M. LUHRING, BRIAN D. TODD, BRIAN S. METTS, GABRIELLE J. GRAETER, AND J. WHITFIELD GIBBONS. Savannah River Ecology Lab, University of Georgia—Preliminary results of an experimental study of salamander (*Ambystoma* spp.) responses to intensive forest management.

Plant Ecology I

Patton

Presiding: Nicole Turrill Welch, Middle Tennessee State University

- 9:0046GRAHAM, JAMES, GARY WALKER, RAY WILLIAMS, ZACK MURRELL AND ART REX. Appalachian State University—Hemlock ecosystems and spatial patterns of hemlock woolly adelgid infestation in northwestern North Carolina.
- 9:1547COLEMAN, DWAYNE E., CHRIS MEYER, PATRICK DWYER AND NICOLE TURRILL WELCH. Middle Tennessee State University—Seasonal changes in herb layer cover and species composition in Table Mountain pine (*Pinus pungens* Lamb.) forests of the Great Smoky Mountains National Park, Tennessee.
- 9:3048WELCH, NICOLE TURRILL, DWAYNE COLEMAN AND CHRIS MEYER. Middle Tennessee State University—Post-wildfire regeneration of *Pinus pungens* in the Cherokee National Forest, Tennessee.
- 9:4549LUKEN, JAMES O. Coastal Carolina University—Establishment and release of Venus’ fly traps in mowed clearings on the rims of Carolina bays.
- 10:00-10:30COFFEE BREAK
- 10:3050PIERCE, SAM AND MACIEJ BIERNACKI. University of Memphis—Predicting flowering time in lilacs: a heat accumulation model.
- 10:4551NEAL, REBECCA¹, KEVIN BRINCK², PAUL BANKO², MARTIN CIPOLLINI¹ AND GARY BRETON. Berry College¹ and USGS Pacific Island Ecosystems Research Center²—Intraspecific variation in quinolizidine alkaloids of mamane (*Sophora chrysophylla*) seed embryos: relevance to specialist seed predation by palila (*Loxioides bailleui*) and *Cydia* spp.

- 11:00 52 **WALCK, JEFFREY L.¹, JERRY M. BASKIN², CAROL C. BASKIN² AND SITI N. HIDAYATI¹.** Middle Tennessee State University¹ and University of Kentucky²—Defining transient and persistent seed banks based on germination seasons: ecological and evolutionary perspectives.
- 11:15 53 **FITCH, ELIZABETH A., JEFFREY L. WALCK AND SITI N. HIDAYATI.** Middle Tennessee State University—Photoecology of seed germination for two rare *Paysonia* species (Brassicaceae): consequences for management in an agroecosystem.

THURSDAY AFTERNOON SYMPOSIA

Plant Systematics II Riverfront A and B

Presiding: Mark Fishbein, Mississippi State University

- 1:30 54 **MURRELL, ZACK.** Appalachian State University—Phylocode and species concepts: is pattern versus process a useful construct?
- 1:45 55 **WYNNS, JUSTIN, JARED KEITH AND ZACK MURRELL.** Appalachian State University—Taxonomic studies in the aquatic moss genus *Platyhypnidium* M. Fleisch.
- 2:00 56 **PARKS, MARGARET AND MARK FISHBEIN.** Mississippi State University—Preliminary phylogeny of the Southeastern *Matelea* (Apocynaceae).
- 2:15 57 **DOFFITT, CHRIS H. AND MARK FISHBEIN.** Mississippi State University—Phylogenetic relationships of the genus *Amsonia* (Apocynaceae) in North America.
- 2:30 58 **ESTES, DWAYNE AND RANDALL L. SMALL.** The University of Tennessee, Knoxville—A preliminary analysis of the phylogenetic relationships of the monotypic genus *Amphianthus* (Scrophulariaceae s.l.) using noncoding chloroplast DNA and comparative morphology.
- 2:45 59 **SHAW, JOEY AND RANDALL SMALL.** University of Tennessee—Chloroplast DNA phylogeny and phylogeography of the North American plums (*Prunus* subgenus *Prunus* section *Prunocerasus*; Rosaceae).
- 3:00-3:30 **COFFEE BREAK**

- 3:30 60 **BECK, JOHN AND RANDALL SMALL.** University of Tennessee—Preliminary investigation of *Sida* and related genera (Malvaceae) based on analysis of two chloroplast DNA regions.
- 3:45 61 **FARMER, SUSAN B. AND EDWARD E. SCHILLING.** University of Tennessee—Additional insights into Trilliaceae phylogeny: the *Delostylis* group.
- 4:00 62 **LICKEY, EDGAR B., KAREN W. HUGHES AND RONALD H. PETERSEN.** University of Tennessee, Knoxville—Surveying the mushroom-forming mycota of the Great Smoky Mountains National Park for the ATBI.
- 4:15 63 **NOBLE, SARAH MARIE AND JUAN M. LOPEZ-BAUTISTA.** The University of Alabama—Ongoing investigations on the subaerial Trentepohliales (Ulvophyceae, Chlorophyta) in the Southeastern USA.
- 4:30 64 **ALIYU, BALA S.^{1, 2}, K. AL-ARID² AND L.J. MUSSELMAN².** Bayero University, Nigeria¹, Old Dominion University²—Light microscopic study of the sporophyll anatomy of some *Isoetes* species.
- 4:45 65 **EAKIN, DAVID A.** Eastern Kentucky University—Syncroscopy™: biological illustration from hand to hi tech.

Microbiology I
Sweetwater B

Presiding: Henry G. Spratt, Jr., University of Tennessee at Chattanooga

- 1:30 66 **DAWSON, LETHA, JESSICA CHIASSON AND RAJ BOOPATHY.** Nicholls State University—Microbial fermentation of post-harvest agricultural residue for energy production in the form of fuel alcohol.
- 1:45 67 **DOOLITTLE, MARK AND RAJ BOOPATHY.** Nicholls State University—Use of orange oil extract and other natural products to eliminate symbiotic gut microbes of Formosan subterranean termite.
- 2:00 68 **HASSAN, KOMI, QUENTON FONTENOT, MARILYN KILGEN AND RAJ BOOPATHY.** Nicholls State University—Microbial removal of carbon and nitrogen from shrimp aquaculture wastewater.
- 2:15 69 **LOUGHMAN, KATHLEEN, ANDREW JOHNSON, LISA SMITH AND CHARLES SOMERVILLE.** Marshall University—Testing a bacteria-based bioindicator of water quality above and below USACE impoundments in the Big Sandy watershed.

- 2:30 70 **JOHNSON, CHRISTINA, APRIL KEENAN AND CHARLES SOMERVILLE.** Marshall University—Testing antibiotic resistance and fecal coliform as bioindicators of water quality for the Great Kanawha River, West Virginia.
- 2:45 71 **KEENAN, APRIL, CHRISTINA JOHNSON AND CHARLES C. SOMERVILLE.** Marshall University—Multiple antibiotic resistance patterns of microbes from the great Kanawha River.
- 3:00-3:30 **COFFEE BREAK**
- 3:30 72 **BELVA, KASEY, SHANNON CAGLE, MATTHEW CAMPBELL, JACOB SLACK AND HENRY G. SPRATT, JR.** University of Tennessee at Chattanooga—The use of a bacterial battery to produce hydrogen via electrolysis.
- 3:45 73 **CAGLE, SHANNON, KASEY BELVA, MATTHEW CAMPBELL, JACOB SLACK AND HENRY G. SPRATT, JR.** University of Tennessee at Chattanooga—Establishment of a bacterial battery using freshwater riparian sediments.
- 4:00 74 **SMITH, LISA M, ANDREW N. JOHNSON, KATHY R. LOUGHMAN AND CHARLES C. SOMERVILLE.** Marshall University—Using antibiotic resistant and fecal indicator bacteria to detect recurring problem areas along the Ohio River.
- 4:15 75 **ELLISON, MATTHEW L. AND FRANKLIN R. CHAMPLIN.** Mississippi State University—Effect of permeabilization on outer membrane exclusionary properties for hydrophobic antimicrobial agents such as triclosan in *Pseudomonas aeruginosa*.
- 4:30 76 **FREDERICK, L., ADRIENNE BOLDEN, A. FREDERICK AND W. LENA AUSTIN.** Howard University—Effect of antifungal properties from a dark-pigmented strain of *Bacillus mojavensis* on spore germination of selected fungal species.

Aquatic Ecology Sweetwater A

Presiding: Neil Billington, Troy University

- 1:30 77 **GRECO, TONY AND MICHAEL WINDELSPECHT.** Appalachian State University—An assessment of Southern Appalachian wetlands: Developing an index methodology.
- 1:45 78 **NORTH, CHRISTOPHER A. AND ROBERT U. FISCHER.** Eastern Illinois University—The effects of agricultural land-use on stream fish and invertebrate community structure.

- 2:00

79

HANEY, DENNIS¹, WADE WORTHEN¹ AND LAURA BOYD². Furman University¹ and College of the South²—Fish, aquatic insect, and riparian vegetation communities upstream and downstream of a proposed dam site on the Tyger River, South Carolina.
- 2:15

80

KING, JOHN AND THOMAS G. JONES. Marshall University—Citizen benthic monitoring and how it is being used in West Virginia to compare biological conditions between an acid mine drainage site and a potential reference site in the Morris Creek watershed.
- 2:30

81

METZKE, B. A., R. U. FISCHER AND C. L. PEDERSON. Eastern Illinois University—The impacts of altered zooplankton community dynamics on electivity of juvenile fish in a cooling water reservoir.
- 2:45

82

EZELL, P. TAYLOR, BENJAMIN M. COALE, BRETT A. MACK AND NEIL BILLINGTON. Troy University—Lake trophic state index for southeastern Alabama water bodies.
- 3:00-3:30

COFFEE BREAK
- 3:30

83

SCHAUS, MAYNARD H.¹, CAREYANN WEINBERG¹, MELISSA A. VINDIGNI¹, WALT GODWIN², LARRY BATTOE² AND RANDY ROTH². Virginia Wesleyan College¹ and St. John's River Water Management District²—Nitrogen and phosphorus release by gizzard shad (*Dorosoma cepedianum*) and its implications for eutrophication control and restoration of Lake Apopka, Florida.
- 3:45

84

TENINI, JOHN AND DENNIS HANEY. Furman University—Increased estrogen levels associated with wastewater treatment plants in the lower Broad River watershed, South Carolina.
- 4:00

85

NOVOVESKA, LUCIE¹, SCOTT W. PHIPPS² AND CHARLES L. PEDERSON¹. Eastern Illinois University¹, Weeks Bay National Estuarine Research Reserve²—Benthic algal community structure and bioaccumulation of mercury in a coastal watershed.

Herpetology II
O'Neal

Presiding: George R. Cline, Jacksonville State University

- 1:30

86

GRAETER, GABRIELLE J. Savannah River Ecology Laboratory—Habitat selection and movement patterns of southern leopard frogs (*Rana sphenocephala*) in response to altered forest habitats.
- 1:45

87

RICHTER, STEPHEN C. Eastern Kentucky University—Effects of habitat fragmentation on population persistence of rare gopher frogs.

- 2:00 88 **GIBBONS, MEGAN.** Birmingham-Southern College and Washington University in St. Louis—Predator diversity and the evolutionary effect on behavior and survival in tadpoles of gray treefrogs (*Hyla versicolor*).
- 2:15 89 **SIAS, JAIME AND THOMAS K. PAULEY.** Marshall University—Water pH tolerance levels for *Hemidactylium scutatum* and *Rana sylvatica* at high elevation fens in West Virginia.
- 2:30 90 **PRICE, STEVEN J.¹, MICHAEL E. DORCAS, ALISA L. GALLANT², ROBERT W. KLAVER AND JOHN D. WILLSON³.** Davidson College¹, USGS/EROS Data Center, Sioux Falls, SD², Savannah River Ecology Laboratory³—Impact of land cover change on stream salamander populations in the Piedmont of the eastern United States.
- 2:45 91 **BAUMAN, MICHAEL L.¹ AND LAWRENCE A. WILSON².** Emory University¹ and Fernbank Science Center²—The population status and limiting factors of the eastern hellbender (*Cryptobranchus alleganiensis*) in the Tennessee River Drainage of Georgia.
- 3:00-3:30 **COFFEE BREAK**
- 3:30 92 **MILLER, BRIAN T. AND MATTHEW L. NIEMILLER.** Middle Tennessee State University—Survey for and relative abundance of the Tennessee cave salamander complex, *Gyrinophilus pallescens* and *G. gulolineatus*, in Tennessee.
- 3:45 93 **FELIX, ZACHARY¹, YONG WANG¹ AND CALLIE SCHWEITZER².** Alabama A&M University¹, and USDA Forest Service, Southern Research Station²—The effect of changing canopy cover on amphibian oviposition rates.
- 4:00 94 **WYCKOFF, GEORGE R., MATT NIEMILLER, BRAD GLORIOSO AND BRIAN MILLER.** Middle Tennessee State University—Community structure of a complex wetland: chronology of breeding migrations of five ambystomatid salamanders.
- 4:15 95 **NIEMILLER, MATTHEW L. AND BRIAN T. MILLER.** Middle Tennessee State University—Demography of the Tennessee cave salamander complex (*Gyrinophilus pallescens* and *Gyrinophilus gulolineatus*) in Tennessee.
- 4:30 96 **COLEMAN, ANDREW¹, ROBERT WAYNE VAN DEVENDER¹, MARY U. CONNELL¹ AND PAUL CHIPPINDALE².** Appalachian State University¹ and University of Texas, Arlington²—Systematic relationship between *Plethodon longicrus* and *Plethodon yonahlossee*.

Plant Ecology II

Patton

Presiding: Thomas Wentworth, North Carolina State University

- 1:30 97 WENTWORTH, THOMAS AND KRISTEN ROSENFELD.** North Carolina State University—Responsible conduct of field research.
- 1:45 98 GAGE, KARLA , MELISSA LEE AND MACIEJ BIERNACKI.** University of Memphis—Plant response to resource gradients.
- 2:00 99 HANCOCK, THOMAS E. AND WILLIAM K. SMITH.** Wake Forest University—Water availability is not a limiting factor for photosynthesis in two east coast (USA) beach plants, *Amaranthus pumilus* and *Cakile edentula*.
- 2:15 100 KNEBEL, LARISSA, DANIEL J. ROBISON AND THOMAS R. WENTWORTH.** North Carolina State University—Resin flow responses to fertilization, wounding, and fungal inoculation in loblolly pine (*Pinus taeda*) in North Carolina.
- 2:30 101 GIBSON, PHIL¹, STANLEY RICE² AND CLARE STUCKE.¹** Agnes Scott College¹ and Southeastern Oklahoma State University²—Levels and structuring of population genetic variation in a rare tree species *Alnus maritima* (seaside alder).
- 2:45 102 REILLY, CHRISTHOPHER D.¹, M. CATHERINE BRODERICK¹, KATHLEEN M. SEESE¹, DAVID GLICK¹, SUSAN JONES-HELD¹ AND MICHAEL E. HELD².** King's College¹ and Saint Peter's College²—Microbial communities on leaf surfaces and their relation to pathogenesis in American beech (*Fagus grandifolia*).
- 3:00-3:30 COFFEE BREAK**
- 3:30 103 SOUZA, LARA¹, JENNIFER M. NAGEL¹, E. CAYENNE ENGEL¹, JAKE F. WELTZIN¹ AND RICH J. NORBY².** University of Tennessee¹ Oak Ridge National Lab²—Can daily carbon gain of four old-field species explain their performance in a community under global climate change?
- 3:45 104 KINCAID, JOSHUA A.** University of Georgia—The status of *Tsuga canadensis* L. (Carr.) (eastern hemlock) regeneration in southern Appalachian upland forests.
- 4:00 105 WELTZIN, JAKE F., GREGORY M. CRUTSINGER, MATTHEW C. FITZPATRICK, MARTIN A. NUÑEZ, CHRISTOPHER M. OSWALT, JILL M. STEPHENS, PHILIP B. ALLEN AND NATHAN J. SANDERS.** University of Tennessee—Combined and relative effects of resource availability, propagule pressure, and insect herbivores on invasion in an old-field system.

FRIDAY, APRIL 15, 2005

FRIDAY MORNING SYMPOSIA

Plant Biology
Sweetwater C

Presiding: Lytton J. Musselman, Old Dominion University

- 9:00 106 FISHBEIN, MARK¹, ROBERT A. RAGUSO² AND TRACEY A. SLOTTA³. Mississippi State University¹, University of South Carolina², USDA-ARS³—Characterization of the floral scents of *Asclepias exaltata*, *A. syriaca*, and their hybrid in a naturally occurring hybrid zone.
- 9:15 107 AL-ZEIN, MOHAMMAD S¹, KHOUZAMA M. KNIO² AND LYTTON J. MUSSELMAN¹. Old Dominion University¹, American University of Beirut²—A preliminary study of the floral biology of *Michauxia campanuloides* L'Hér. (Campanulaceae).
- 9:30 108 ALARID, KHALID M, REBECCA D. BRAY AND LYTTON J. MUSSELMAN. Old Dominion University—Microspore wall morphogenesis of *Isoetes* (Isoetaceae).
- 9:45 109 ALIYU, BALA S.^{1, 2}, A. M. EMECHEBE³ AND B. B. SINGH³. Bayero University, Nigeria¹, Old Dominion University² and International Institute of Tropical Agriculture (IITA), Nigeria³—The cultural control of *Striga hermonthica* on pearl millet (*Pennisetum glaucum*) through inter-row and intra-row intercropping with cowpea (*Vigna unguiculata*).
- 10:00-10:30 COFFEE BREAK
- 10:30 110 TENNAKOON, KUSHAN U.^{1,2}, JAY F. BOLIN¹ AND LYTTON J. MUSSELMAN¹. Old Dominion University¹ and University of Peradeniya, Sri Lanka²—Functional attributes of the root holoparasitic genus *Hydnora*.
- 10:45 111 HAMISSOU, MIJITABA. Jacksonville State University—Molecular analyses of cadmium toxicity in *Arabidopsis*, and sorghum.
- 11:00 112 POLLARD, A. JOSEPH AND CHRISTINE R. DONHARDT. Furman University—Genetic variation in nickel hyperaccumulation in the *Alyssum serpyllifolium* complex from the Iberian Peninsula.

Microbiology II/Parasitology Sweetwater B

Presiding: Alan F. Smith, Mercer University

- 9:00 113 BRAY, AMANDA, MICHAEL LAND, JAMIE CHERRY AND TYLER CHANCE.** Northwestern State University—Use of the chicken embryo bioassay for isolated embryo pathogens modified with fluorescent protein producing plasmids.
- 9:15 114 LAND, MICHAEL, FRANK YRLE, BRENT HARDY AND CODY COLE.** Northwestern State University—Isolation and quantitation of mortality causing pathogens in commercial egg laying houses.
- 9:30 115 DEES, WILLIAM¹, JONATHAN DAVIS² AND JULI TRTANJ³.** McNeese State University¹, Dynamics Technology, Inc.² and National Oceanographic and Atmospheric Administration³—Redefining disease surveillance: Integrated methodologies for infectious disease control.
- 9:45 116 ELLIS, JOSHUA, MELISSA HARRISON, JACKIE DELASH, BRIAN SPARKS, GREEN BERRY STARNES IV AND ALAN F. SMITH.** Mercer University—Preliminary studies in the detection of *Borrelia burgdorferi*, *B. lonestari*, and *Ehrlichia* spp. from individual *Ixodes scapularis* collected from white-tailed deer of the Piedmont National Wildlife Refuge.
- 10:00-10:30 COFFEE BREAK**
- 10:30 117 DELASH, JACKIE, MELISSA HARRISON, JOSHUA ELLIS, BRIAN SPARKS, GREEN BERRY STARNES IV AND ALAN F. SMITH.** Mercer University—Prevalence of the causative agents of Lyme disease, STARI, and Ehrlichiosis in male, lone star ticks collected from five middle Georgia counties.
- 10:45 118 YOST, MARLENA C.¹, BRIAN S. DORR² AND LINDA M. POTE¹.** College of Veterinary Medicine, Mississippi State University¹, USDA/APHIS/WS National Wildlife Research Center, Mississippi State, MS²—Conformation of *Bolbophorus damnificus* life cycle and characterization of all life stages.

Education Symposium Sweetwater A

Presiding: John V. Aliff, Georgia Perimeter College, Gwinnett University Center

8:45 Introduction: John V. Aliff

- 9:00 119 **PIGLIUCCI, MASSIMO.** SUNY-Stony Brook—Is evolution a logical fallacy?
- 9:30 120 **FORREST, BARBARA.** Southeastern Louisiana University—Inside creationism's Trojan Horse: a closer look at Intelligent Design.
- 10:15 121 **EDIS, TANER.** Truman State University—Chance and necessity – and Intelligent Design?
- 10:45 122 **MILLER, KEITH B.** Kansas State University—Countering public misperceptions of evolutionary science.
- 11:15 **Panel Discussion.**

Herpetology III O'Neal

Presiding: Jonathan Akin, Northwestern State University

- 9:00 123 **BLOOD, JACOB, KATHERINE MACKEY AND JONATHAN AKIN.** Northwestern State University—Behavioral Implications of tail status in ground skinks.
- 9:15 124 **ROSIER, HEATH AND JONATHAN AKIN.** Northwestern State University—Adult-juvenile interactions in ground skinks.
- 9:30 125 **HOFFPAUIR, CURTIS AND JONATHAN AKIN.** Northwestern State University—Implications of insect repellent use in observing ground skink lizards.
- 9:45 126 **MEYER, HARRY A. AND MARK A. PAULISSEN.** McNeese State University—Temporal variation in a Mediterranean gecko population from a stable habitat.
- 10:00-10:30 **COFFEE BREAK**
- 10:30 127 **NOEL, KRISTA AND CARL QUALLS.** University of Southern Mississippi—Intrinsic versus extrinsic causes of low hatching success of gopher tortoise (*Gopherus polyphemus*) eggs in south Mississippi.
- 10:45 128 **MCKENNEY, CHRISSIE AND CARL QUALLS.** University of Southern Mississippi—Nest site selection by gopher tortoises in south Mississippi.
- 11:00 129 **VINDIGNI, M., J. KEMPISTA AND M. SCHAUS.** Virginia Wesleyan College—Nitrogen and phosphorus release by turtles in a pond ecosystem: roles of time since feeding, mass, and taxon identity.

Plant Ecology III

Patton

Presiding: Conley K. McMullen, James Madison University

- 9:00 130 SCHOTZ, ALFRED.** Alabama Natural Heritage Program—The rediscovery of *Lindera melissifolia* (Pondberry) in Alabama.
- 9:15 131 McMULLEN, CONLEY K. AND ERIN E. CULPEPPER.** James Madison University—*Cordia lutea* (Boraginaceae), an example of heterostyly in the Galápagos Islands.
- 9:30 132 HURT, KYLE D., RACHAEL B. SULKERS, JEFFREY L. WALCK AND SITI N. HIDAYATI.** Middle Tennessee State University—Effects from the removal of the exotic species *Ligustrum sinense* (Oleaceae) on native vegetation.
- 9:45 133 HELD, MICHAEL E.¹, JOE E. WINSTEAD² AND WILLIAM S. BRYANT³.** Saint Peter's College¹, Southern Arkansas University² and Thomas More College³—Thirty years on: recovery dynamics of a tornado-damaged forest in Boone County, Kentucky.
- 10:00-10:30 COFFEE BREAK**
- 10:30 134 JOHNSON, SARAH. E. AND CLAUDIA L. JOLLS.** East Carolina University, North Carolina—The effects of competition on the threatened dune annual, *Amaranthus pumilus* Raf. (Amaranthaceae).
- 10:45 135 CARTER, ROBERT¹, VICTOR SHELBURNE², AND LEAF KUNKEL¹.** Jacksonville State University¹ and Clemson University²—Successional changes in plant species diversity on the Highlands Ranger District, Nantahala National Forest, North Carolina.
- 11:00 136 BRAGG, DON C.** USDA Forest Service, Southern Research Station—A naturally-occurring *Pinus taeda* L. forest in the Mississippi Valley alluvial plain.
- 11:15 137 BOLIN, JAY F.¹ AND LYTTON J. MUSSELMAN¹.** Old Dominion University¹—Community structure after 18 years of prescribed fire in a Virginia longleaf pine (*Pinus palustris*) sandhill.

FRIDAY AFTERNOON SYMPOSIA

Teaching Biology Sweetwater C

Presiding: Frank A. Romano III, Jacksonville State University

- 1:30 138 CLINE, GEORGE R., FRANK A. ROMANO III, KELLY D. GREGG AND JAMES R. RAYBURN.** Jacksonville State University—Tropical Biology: an integrated science field experience.
- 1:45 139 DAVISON, PAUL G. AND PAUL D. KITTLE.** University of North Alabama—A reliable method for observing the protrusible pharynx in planarians.
- 2:00 140 EAKIN, DAVID A.** Eastern Kentucky University—If Creationism is religion - can we bash it in the public classroom?
- 2:15 141 ALIFF, JOHN VINCENT.** Georgia Perimeter College, Gwinnett University Center—Making sure that science and religion get proper respect.
- 2:30 142 STOCKS, STEPHANIE D., BARBARA J. SPEZIALE, JAMES K. ZIMMERMAN, ROBERT E. BALLARD, JOSEPH D. CULIN, EDWARD B. PIVORUN, TIMOTHY P. SPIRA, JOHN R. WAGNER, JERRY A. WALDVOGEL AND GREG K. YARROW.** Clemson University—Incorporating science technology with field-based lesson plans to enhance natural history education for classrooms both indoors and outdoors.
- 2:45 143 EAKIN, DAVID A.** Eastern Kentucky University—Using Scantrons™ to communicate caring in the large classroom setting.
- 3:00 144 JUETT, BEVERLY W. AND JOHN DELFINO.** Midway College—Student ratings of learning practices in anatomy and physiology I.
- 3:15 145 STOCKS, STEPHANIE D., BARBARA J. SPEZIALE, JAMES K. ZIMMERMAN, ROBERT E. BALLARD, JOSEPH D. CULIN, EDWARD B. PIVORUN, TIMOTHY P. SPIRA, JOHN R. WAGNER, JERRY A. WALDVOGEL AND GREG K. YARROW.** Clemson University—The use of virtual field trips and interactive CDs to enhance natural history education in the classroom.
- 3:30 146 RAYBURN, JAMES R., GEORGE R. CLINE, FRANK A. ROMANO III AND KELLY D. GREGG.** Jacksonville State University—Fish and invertebrate survey in a field exploratory class: Tropical Biology.

- 3:45 147 **BRIGHT, S. KRISTEN, ZACK MURRELL AND TERRY CARROLL.** Appalachian State University—Application of ATBI protocols to faith-based facilities: a model for implementation.
- 4:00 148 **CARTER, M.E.B., S.C. BAKER AND T.W. WADE.** Oxford College of Emory University—"I will be fearless as a teacher!" Lessons from teaching and learning with investigations.

Animal Ecology Patton

Presiding: P. Michael Stewart, Troy University

- 1:30 149 **SAUTERER, ROGER, MARY MILLWOOD AND SHAKA SHAKES.** Jacksonville State University—Analysis of waters and sediments near the Anniston, AL, Monsanto site by FETAX, extended FETAX, and immunoblotting against CYP 1A.
- 1:45 150 **MCCOLLISTER MATTHEW AND TRAVIS PERRY.** Furman University—Flying nocturnal insect communities in burned and unburned coniferous forests of the Sacramento range, New Mexico.
- 2:00 151 **EVETTE, MIKE AND TRAVIS PERRY.** Furman University—Fire ants (*Solenopsis invicta*) as biological control agents on an organic farm.
- 2:15 152 **PILARCZYK, MEGAN M.¹, HOLLY N. BLALOCK-HEROD², PAUL M. STEWART¹ AND BONNIE L. HAMITER¹.** Troy University¹ and U.S Fish and Wildlife Service, Panama City, FL²—Host identification of the tapered pigtoe mussel (*Quincuncina burkei*) and the fuzzy pigtoe mussel (*Pleurobema strodeanum*) at Eightmile Creek in Walton County, Florida.
- 2:30 153 **HEATH, WILLIAM H.¹, JONATHAN M. MILLER¹, PAUL M. STEWART¹ AND THOMAS P. SIMON².** Troy University¹ and Indiana Biological Survey²—Habitat partitioning of crayfish assemblages in wadeable streams in the coastal plains of southeast Alabama.
- 2:45 154 **DUGUAY, JEFFREY P.¹ AND CHERYL FARFARAS².** Delta State University¹, Howard County Department of Recreation and Parks²—A four-year investigation of plant and invertebrate response to management of an overabundant suburban deer population in Maryland.
- 3:00 155 **DUBOIS, ADRIENNE AND TRAVIS PERRY.** Furman University—Potential geographic variation and sexual dimorphism in ecomorphology of the pallid bat (*Antrozous pallidus*).

- 3:15 156 **CARROLL, AMANDA D. AND KIM MARIE TOLSON.** University of Louisiana at Monroe—The effects of silvicultural and hydrological practices on breeding bird communities in northeast Louisiana.
- 3:30 157 **CARPENTER, JOHN P¹, YONG WANG¹, ADRIAN A. LESAK¹, CALLIE JO SCHWEITZER², ERIC C. SOEHREN³ AND MARK SASSER³.** Alabama A&M University¹, US Forest Service² and Alabama Department of Conservation and Natural Resources³—Status of the cerulean warbler (*Dendroica cerulea*) in northern Alabama.
- 3:45 158 **MILLER, JONATHAN M., WILLIAM H. HEATH AND PAUL M. STEWART.** Troy University—Morphological variations among burrowing crayfish in the *Cambarus diogenes* (Girard) complex.
- 4:00 159 **ENSIGN, WILLIAM E.** Kennesaw State University—Why fish can't cross the road: the effect of culvert design on fish movements in small Etowah basin streams.



ASB POSTER SESSIONS

Ballroom

- Poster setup: 7:00 am–8:00 am Thursday
 Posters displayed: 8:00 am–5:30 pm Thursday and
 8:00 am–12:00 Friday
 Presenters with posters: 8:00–9:00 am Thursday and
 8:00–9:00 am Friday
 Poster take down: 12:00–3:00 pm Friday

Animal Ecology

- P1 **BELLANCEAU, C. B. AND G. R. HUXEL.** University of South Florida—Diversity of arthropods in the University of South Florida Ecological Research Area in Tampa, Florida.
- P2 **GROGHAN, SHERI AND ROBERT CARTER.** Jacksonville State University—Species richness and relative abundance of small mammals in green pitcher plant bogs of the Little River National Preserve, Alabama.
- P3 **NIX, ELIZABETH A¹, MICHAEL K. MOORE¹, ALAN F. SMITH¹ AND VICTOR W. TOWNSEND, JR.²** Mercer University¹, Virginia Wesleyan College²—Animal diversity and food web structure of a tank bromeliad fauna from Trinidad, W. I.
- P4 **BARANSKI, MICHAEL J. AND KIM MARIE TOLSON.** University of Louisiana at Monroe—An avian phenology study of two wildlife management areas in northeast Louisiana.

- P5 SMITH, CARLY AND TRAVIS PERRY.** Furman University—Bat foraging rates in burned and unburned coniferous forests of the Sacramento range, New Mexico.
- P6 EDWARDS III, THOMAS¹, DENNIS HANEY¹, VICTORIA TURGEON¹ AND MICHAEL CARABALLO².** Furman University¹ and Universidad Metropolitana²—Metallothionein synthesis and physiological bio-indicators in fish exposed to zinc in the upper Enoree River, South Carolina.
- P7 MILLS, EDWARD, CRYSTAL MOORE AND KATHERINE POWELL.** Wingate University—Responses of aquatic invertebrate communities to habitat modification by beavers (*Castor canadensis*).

Aquatic, Wetland and Marine Management

- P8 PHIPPS, SCOTT W. AND ERIC BRUNDEN.** Weeks Bay National Estuarine Research Reserve—A comparison of floral assemblages from coastal wetland forest sites with different disturbance histories.
- P9 NOBLE, SARAH MARIE, JUAN M. LOPEZ-BAUTISTA AND D. ALBREY ARRINGTON.** The University of Alabama—Macroalgae from impacted and pristine tidal creeks on Andros Island Bahamas.
- P10 OWENS, JANNA¹, ROBERT ANGUS¹, KEN MARION¹, SCOTT KNIGHT² AND ANDREW SIMON².** University of Alabama at Birmingham¹ and USDA-ARS, National Sedimentation Laboratory²—Integrating sediment-related variables with biological assessments of rivers and streams: preliminary results from the Ridge and Valley.
- P11 SHELTON, MICHAEL.** Weeks Bay National Estuarine Research Reserve—Monitoring mercury in largemouth bass tissue in the Weeks Bay watershed.
- P12 SINGLETON, JOSH¹, DANNY MILLICAN² AND CHRIS TAYLOR².** Shorter College¹ and Mississippi State University²—Detecting altered fish assemblages within environmentally modified locales of the Tombigbee River system.

Developmental Biology, Genetics, Cell, and Molecular Biology

- P13 WARNER, CHARLENE AND MIN-KEN LIAO.** Furman University—A quick measurement of genetic diversity within and between bunched arrowhead (*Sagittaria fasciculata*) populations using ISSR.
- P14 BOBOWSKI, CHRISTIE AND ELI V. HESTERMANN.** Furman University—Combinatorial gene regulation by the estrogen and aryl hydrocarbon receptors.

- P15 MITCHELL, GEOFFREY C.¹, XINHAI YANG², DONGHUI LIU², DAVID H. SHERR² AND ELI V. HESTERMANN¹.** Furman University¹ and Boston University²—The aryl hydrocarbon receptor regulates *c-myc* transcription through direct binding to its promoter region in Hs578T breast cancer cells.
- P16 LANE, JESSICA G., LAUREN N. WHISENANT AND ALISON B. DIXON.** Wingate University—Genetic influences on the Bruce Effect using laboratory and wild strains of mice.
- P 17 WALLACE GERRY, STEFANIE RITTER, AND VICTORIA TURGEON.** Furman University—Trypsin localization in the developing avian neuromuscular system.
- P18 LYLES, KELLY AND VICTORIA TURGEON.** Furman University—Trypsin inhibition in an avian motor neuron and skeletal muscle co-culture system does not alter neuromuscular junction formation.

Herpetology

- P19 LOUGHMAN, ZACHARY, CELESTE GOOD AND THOMAS K. PAULEY.** Marshall University—Status of the West Virginia state collection of amphibians and reptiles.
- P20 SUTTON, WILLIAM B., YONG WANG AND CALLIE J. SCHWEITZER.** Alabama A & M University—Response of forest herpetofaunal communities to thinning and prescribed burning in mixed pine-hardwood stands in the William B. Bankhead National Forest, Alabama: study site description and methods.
- P21 ABERCROMBIE, VICTOR, JOSH SINGLETON AND RICKY FIORILLO.** Shorter College—Amphibian diversity and reproduction in a vernal pond in Northwest Georgia.
- P22 GOOD, CELESTE, DEBORAH MERRITT AND THOMAS K. PAULEY.** Marshall University—A preliminary study of the use of man-made ponds for amphibian breeding in fragmented forested areas.
- P23 GOOCH, MICHELLE M.¹, AUBREY M. HEUPEL², STEVEN J. PRICE¹ AND MICHAEL E. DORCAS¹.** ¹Davidson College and ²Iowa State University—The effects of survey protocol on detection probabilities and site occupancy estimates for summer-breeding Anurans.
- P24 ROMBOUGH, NIKKI, CHRISTOPHER BRENNAN AND MEGAN GIBBONS.** Birmingham-Southern College—The affect of prior exposure to chemical cues of predator on antipredator behavior of *Hyla cinerea* tadpoles.

- P25 DELECKI, ANISSA, GEORGE CLINE, JAMES RAYBURN AND MARK MEADE.** Jacksonville State University—Metabolic rates in 24 hour old Cope's gray treefrog (*Hyla chrysoscelis*) larvae at three temperatures.
- P26 PUCKETT, ROSEMARY E. AND NANCY J. BERNER.** Sewanee: The University of the South—The effect of seasonal acclimatization on the standard metabolic rate of eastern red spotted newts (*Notophthalmus viridescens viridescens*).
- P27 BERNER, NANCY J., ROSEMARY E. PUCKETT AND BRADLEY J. WAFFA.** Sewanee: The University of the South—Identifying possible structural differences in some metabolic enzymes of summer- and winter-acclimatized eastern red spotted newts (*Notophthalmus viridescens viridescens*).
- P28 LOUGHMAN, ZACHARY, DEBORAH MERRITT AND THOMAS K. PAULEY.** Marshall University—Black-bellied salamander (*Desmognathus quadramaculatus*) feeding ecology across the Southern Appalachians.
- P29 MERRITT, DEBORAH, CHRISTOPHER BARRY AND THOMAS K. PAULEY.** Marshall University—Comparison of age, size, and reproductive status of six populations of black-bellied salamanders (*Desmognathus quadramaculatus*).
- P30 CAMPBELL, SELENA AND RICKY FIORILLO.** Shorter College—Effects of predation risk on activity and substrate choice of *Eurycea cirrigera* larvae.
- P31 ELLIOTT, JOHNATHAN, JANEAN WINTERS AND JEFFREY P. DUGUAY.** Delta State University—Habitat use by marbled salamanders at Dahomey National Wildlife Refuge.
- P32 STEWART, KELLEY R.¹, S. DOUG KAYLOR¹, MARK K. WATSON² AND THOMAS K. PAULEY¹.** Marshall University¹ and University of Charleston²—The effects of pesticides Gypcheck and *Btk* on Plethodontidae salamanders.
- P33 HESTER, JOY M., STEVEN J. PRICE AND MICHAEL E. DORCAS.** Davidson College—Effects of relocation on movements and home ranges of eastern box turtles (*Terrapene carolina*).
- P34 SARAH A. BUDISCHAK, JOY M. HESTER, MICHAEL E. DORCAS AND STEVEN J. PRICE.** Davidson College—The natural history of box turtles (*Terrapene carolina*) in an urbanized landscape.
- P35 KORNILEV, YURII V., STEVEN J. PRICE AND MICHAEL E. DORCAS.** Davidson College—Responses of eastern box turtles (*Terrapene carolina*) when trapped between railroad tracks.

- P36 KORNILEV, YURII V., MUR MUCHANE AND MICHAEL E. DORCAS.** Davidson College—Online identification system for North Carolina snakes: a novel approach to an old problem.
- P37 COBAIN, ERIN F., WILLIAM C. HAAS AND MICHAEL, E. DORCAS.** Davidson College—An investigation of physiological and behavioral thermoregulation during heating and cooling in *Charina bottae*.
- P38 SANDERS, CLAY C., TERRY D. SCHWANER AND IRENE KOKKALA.** North Georgia College and State University—Relationships between size and age in tigersnakes (Elapidae: *Notechis ater*) estimated from mark-release-recapture studies and skeletochronology.
- P39 HILL, E. PIERSON, WILLIAM J. JOHNSON AND MICHAEL E. DORCAS.** Davidson College—Habitat selection in black ratsnakes (*Elaphe obsoleta obsoleta*) in the western Piedmont of North Carolina.
- P40 JOHNSON, WILLIAM J., E. PIERSON HILL AND MICHAEL E. DORCAS.** Davidson College—Home range size and site fidelity of black rat snakes (*Elaphe obsoleta*) in the western Piedmont of North Carolina.

Invertebrate Zoology

- P41 HAYES, DAVID M., JOHN D. WHITE, JEFF A. BROOKS AND RUSSELL L. MINTON.** University of Louisiana at Monroe—Distribution and diversity of freshwater gastropods in Bayou Bartholomew, Arkansas.
- P42 MINTON, RUSSELL L.¹ AND KATHRYN E. PEREZ².** University of Louisiana at Monroe¹ and University of Alabama²—A systematic checklist of the land snails of Louisiana.
- P43 LOUGHMAN, ZACHARY.** Marshall University—Survey of crayfish (Decapoda: Cambaridae) species along the Ohio River floodplain in West Virginia.
- P44 TOWNSEND JR.¹, VICTOR R. AND CARY A. GUFFEY².** Virginia Wesleyan College¹ and Our Lady of the Lake University²—Sexual and seasonal variation in parasitism by erythraeid mites (*Leptus*) on three species of harvestmen (*Leiobunum*).
- P45 PROUD, DANIEL N., JENNIFER O. BRADFORD, KIMBERLY A. MULHOLLAND, DANIEL S. MARGOLIES AND VICTOR R. TOWNSEND, JR.** Virginia Wesleyan College—Seasonal use of beehives by *Leiobunum formosum* (Opiliones, Sclerosomatidae).
- P46 WILTSHIRE, VITILLIA¹, MICHAEL J. RUBBO² AND VICTOR R. TOWNSEND, JR.¹** Virginia Wesleyan College¹ and Virginia Polytechnic Institute²—Variation in tree usage by juvenile and adult *Leiobunum formosum* (Opiliones, Sclerosomatidae) in southeastern Virginia.

P47 SARACINA, CHRISTINA L. AND C. BRIAN ODOM. Wingate University—Prevalence of two social forms of the red imported fire ant, *Solenopsis invicta*, (Buren), in Union County, North Carolina.

P48 SUDBRINK, DONALD L. AND STEVEN HUGHES. Delta State University—Tri-trophic goldenrod-gall insect communities in the Mississippi Delta: influence of landscape.

Microbiology

P49 KIRKER G. T., S. V. DIEHL AND M. L. PREWITT. Mississippi State University—Effects of Chlorothalonil (CTN) and Butylated Hydroxy Toluene (BHT) on microbial communities involved in deterioration of wood using T-RFLP.

P50 CLAXTON, JESSICA L. AND ANNA R. OLLER. Central Missouri State University—Antibiotic resistance determination of oral microbes.

P51 BOLDEN, ADRIENNE¹, L. FREDERICK¹, R. MICHELIN² W. LENA AUSTIN² AND A. L. WILLIAMS². Howard University¹ and Morgan State University²—Further studies on the antifungal effects of a dark-pigmented strain of *Bacillus mojavensis*.

P52 POWELL, MARTHA J., WILL H. BLACKWELL, PETER M. LETCHER AND PERRY CHURCHILL. The University of Alabama—Species richness of chytrid fungi in benthic and metaphyton assemblages.

P53 ROBERTS, ANDREW AND SIGURDUR GREIPSSON. Troy University—Arbuscular mycorrhizal fungi (AMF) infection potential and spore numbers in soil of ecozones across coastal sand dune ecosystem on Dauphin Island, Alabama.

P54 OLLER, ANNA R. Central Missouri State University—Fungal polysaccharides visualized via modified staining.

P55 LANDRY, DAWN L. AND STEPHEN C. LANDERS. Troy University—Protists from Lake Lagoona on the Troy University Campus.

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Lobby of Shoals Conference Center

ABSTRACTS - PAPERS

- 1 JONES, RONALD L. Eastern Kentucky University—Current concepts for classification of the traditional family "Liliaceae," with a treatment for Kentucky.

In recent years the genera of the traditional family "Liliaceae" have been separated into three orders (Asparagales, Dioscoreales, and Liliales) and about two dozen families worldwide. These new treatments have been based on information from genetics, cladistics, and morphological analyses. By adhering strictly to monophyletic concepts, workers defined many families very narrowly, often consisting of only a few genera. Most recently, there has been a reversal toward broader concepts in some groups. There is general consensus among workers for some groups of families, while others remain debatable. For a statewide treatment of Kentucky vascular plants, the following "liliaceous" families were accepted, with Kentucky genera indicated: Agavaceae (*Yucca*, *Manfreda*), Alliaceae (*Allium*, *Northoscordum*), Amaryllidaceae (*Hymenocallis*, *Leucojum*, *Lycoris*, *Narcissus*), Asparagaceae (*Asparagus*), Convallariaceae (*Convallaria*, *Maianthemum*, *Polygonatum*), Hemerocallidaceae (*Hemerocallis*), Hyacinthaceae (*Muscari*, *Ornithogalum*, *Camassia*), Hypoxidaceae (*Hypoxis*), Liliaceae (*Clintonia*, *Erythronium*, *Lilium*), Melanthiaceae (*Amianthium*, *Chamaelirium*, *Melanthium*, *Stenanthium*, *Veratrum*, *Xerophyllum*), Nartheciaceae (*Aletris*), Smilacaceae (*Smilax*), Trilliaceae (*Trillium*), and Uvulariaceae (*Prosartes*, *Streptopus*, *Uvularia*).

- 2 JONES, RONALD L. Eastern Kentucky University—Recognition of segregate genera in the Asteraceae of Kentucky.

In preparing a statewide treatment for the Asteraceae of Kentucky, a number of decisions had to be made concerning the classification of genera in the Asteraceae. Many recent changes had been proposed from a number of authors, and while some have been generally accepted, others remained controversial. The proposed changes were based on molecular, cladistic, and morphological evidence. Some authors of recent published books had accepted all or most of the changes, while others were reluctant to follow any of the new classifications. The following decisions were made concerning generic classification in the Asteraceae, with number of taxa indicated---traditional *Eupatorium*: *Ageratina* (3 species), *Conoclinium* (1 species), *Fleischmannia* (1 species), *Eupatorium* (15 species + 2 varieties); traditional *Cacalia*: *Arnoglossum* (2 species), *Cacalia* (0 species), *Hasteola* (1 species); traditional *Aster*: *Aster* (1 species), *Doellingeria* (2 species), *Eurybia* (7 species), *Ionactis* (1 species), *Oclemena* (1 species), *Sericocarpus* (2 species), *Symphotrichum* (24 species + 2 varieties); traditional *Heterotheca*: *Chrysopsis* (2 species), *Heterotheca* (2 species), *Pityopsis* (1 species); traditional *Solidago*: *Euthamia* (2 species), *Oligoneuron* (1 species), *Solidago* (31 species + 4 varieties); traditional *Gnaphalium*: *Gamochaeta* (1 species), *Gnaphalium* (1 species), *Pseudognaphalium* (2 species); traditional *Senecio*: *Packera* (6 species), *Senecio* (1 species); traditional *Polymnia*: *Polymnia* (2 species), *Smallanthus* (1 species).

- 3 TUCK, SHELLEY N. AND MICHAEL WOODS. Troy University—A distributional and taxonomic study of the genus *Ipomoea* (Convolvulaceae) in Alabama.

Ipomoea, commonly known as the Morning Glory genus, is a member of the tribe Ipomoeae of the Convolvulaceae. The genus was first described in 1753 by Linnaeus. Of the more than 600 taxa reported worldwide, 70 occur in the United States. Of the 36 taxa reported from the southeastern United States, 19 have been documented from Alabama. Of these, ten are native. The remaining nine species, *I. cairica*, *I. coccinea*, *I. cordifolia*, *I. hederacea*, *I. indica*, *I. purpurea*, *I. quamoclit*, *I. turbinata*, and *I. wrightii* are naturalized in the state. Of these nine non-native species, two, *I. hederacea* and *I. purpurea*, were introduced as horticultural plants but have escaped to become noxious weeds. Data for

this research was collected from field collections and over 500 herbarium specimens. The eight herbaria that loaned specimens were Troy University (TROY), Auburn University (AUA), The University of Alabama (UNA), Jacksonville State University (JSU), University of North Alabama (UNAF), University of South Alabama (USA), the University of West Florida (UWFP), and the Vanderbilt Herbarium (VDB), housed at the Botanical Research Institute of Texas (BRIT). Species descriptions and dichotomous keys were prepared from morphological data obtained from the examination of the herbarium specimens and field collections from throughout the state. County-level distribution maps were prepared from both the herbarium specimens and field collections.

- 4 WINDHAM, THOMAS L., MICHAEL WOODS AND ALVIN R. DIAMOND, JR.
Troy University—The fern and fern allies of Southeast Alabama.

A study of the county-level distribution of the Fern and Fern Allies of Southeast Alabama was conducted through field work and a survey of specimens deposited in regional herbaria. A total of 16 families, 28 genera, 52 species and 2 infraspecific taxa were found to occur in the 12 counties that comprise Southeast Alabama. The herbaria of Troy University (TROY), Auburn University (AUA), Jacksonville State University (JSU), and The University of Alabama (UNA) were searched for specimens previously collected from the study area. Field work was conducted from October 2003 to February 2005 to document additional taxa and county records. Voucher specimens for all new county distribution records are deposited in the herbarium of Troy University (TROY). Support for this project was provided by the Troy University Chancellor's Fellowship.

- 5 GADDY, L. L.¹ AND JOHN B. NELSON². terra incognita, inc¹ and University of South Carolina²—Vascular plant inventory of Congaree National Park.

The Congaree National Park (formerly Congaree Swamp National Monument) comprises 22,000+ acres on the north side of the Congaree River in central South Carolina, located about 30km southeast of Columbia, the state's capital and largest metropolitan area. Its 20,000 acres are wholly contained within the floodplain and bordering high ground of the Congaree River. The south side of the river, although not a part of the National Park, features steep ironstone-capped bluffs rising 60m above the river itself. This Park is remarkable for its well-developed bottomland communities, including variants of bottomland hardwood, natural levees, sand bars, seepage slopes, guts, and deep-water oxbow lakes. Congaree's public renown and the original impetus for its preservation come largely from its significant acreage of truly old-growth bottomland forests, the largest contiguous tract of its kind in the United States. Despite occasional ravages of major hurricane events (including Hurricane Hugo in 1989), Congaree Park contains a large number of "big" trees, a number of which are national champions. The Park contains over 90 tree species, one of the highest numbers, proportionally, of all the National Parks. Additionally, the liana flora is impressive, with at least 25 species. Over 700 species of vascular plants are documented for this site, including 50 in the genus *Carex*.

- 6 BARRON, JENNIFER, GINA CHILDERS, MICHELLE CLIFTON AND MICHAEL WAYNE MORRIS. North Georgia College & State University—A preliminary survey of the vascular flora of Ramblewood, Lumpkin County, Georgia.

A preliminary survey of the vascular plants of Ramblewood, Lumpkin County, Georgia, was conducted from August 2004 through November 2004. The study is a privately owned tract of land (approximately 6,500 ha) used for annual Dahlonaga Wildflower Festival field trips. Ramblewood is in the Upper Chattahoochee River Watershed and on the border of the Piedmont and Blue Ridge physiographic regions. Plant communities range from upland oak-hickory-pine forest to mesophytic forest on ravine slopes and bluffs to riparian zone vegetation along Yahoola Creek. Specimens of vascular plants were processed

utilizing standard herbarium techniques. Preliminary field surveys resulted in the documentation of 73 families, 184 genera, and 262 species. Of these taxa, there were 22 invasive species. Rare and unusual species or taxa of special concern tracked by the Georgia Department of Natural Resources include *Cypripedium parviflorum* var. *pubescens*, *Hexastylis shuttleworthii*, *Menispermum canadense*, *Panax quinquefolius*, and *Spiranthes ovalis*. This study will continue through year 2005 to account for flora characterizing the vernal aspect of the region.

- 7 STALTER, R. AND ERIC E. LAMONT. St. John's University, New York Botanical Garden—The vascular flora of Great Gull Island, New York.

The vascular flora of Great Gull Island, a 6.9 hectare site in eastern Long Island Sound, consists of 203 species in 142 genera and 55 families. The Asteraceae with 33 species and 25 genera and Poaceae with 34 species and 24 genera are the largest families in the flora. Together they compose 33% of the flora. One hundred fifteen species, nearly 57% of the flora are non-native. The most common species at Great Gull are the non-native *Raphanus raphanistrum* and *Celastrus orbiculatus*. Three general communities exist here: (1) a shrub/liana community dominated by *Celastrus orbiculatus*, (2) a human disturbed ruderal community composed mostly of *Raphanus* and (3) lawn and gardens populated by grasses and forbs, most of which are non-native. Periodic maintenance throughout the island to create favorable habitat for nesting terns provides a fertile habitat for invasive non-native species.

- 8 COX, PATRICIA B.¹ AND ALAN S. WEAKLEY². Tennessee Valley Authority¹ and University of North Carolina Herbarium²—*Bupleurum gerardii* All. (Apiaceae), a new "weed" in Tennessee.

Bupleurum gerardii, an annual member of the carrot family, was found growing on limestone under a transmission line in Wilson Co., TN. This species has a fairly widespread distribution in southern Europe, but is not a common weed. Its typical habitat is Mediterranean maquis and forest communities, associated with limestone. A specimen collected in the 1960's from Giles Co., VA, also growing on limestone, was found in the Virginia Tech herbarium and recently identified as this native European plant. To date this species is known from only these two counties in North America.

- 9 WILLIAMS, CHARLIE¹, ELIANE M. NORMAN² AND GERARD G. AYMONIN³. André Michaux International Society¹, Stetson University² and Muséum National d'Histoire Naturelle, Paris³—The type locality of *Shortia galacifolia* visited once again.

In 1839 Asa Gray found an undescribed specimen in André Michaux's collection in the Muséum National d'Histoire Naturelle, Paris that he subsequently named *Shortia galacifolia*. The type locality for this species has been of interest to botanists and the subject of several studies. The original type specimen in Michaux's herbarium has disappeared, but a fragment given to Asa Gray in 1839 remains in the Gray herbarium at Harvard. We have recently found an isotype of this species in the de Jussieu collection at the Paris herbarium. De Jussieu labeled this specimen with information that enables us to substantiate the correct date of collection and type locality for this taxon.

- 10 HADDEN, CARRIE B., JOHN M. HERR, JR. AND JOHN B. NELSON. University of South Carolina—Status and evaluation of the Herbarium of Henry W. Ravenel (1814-1887).

The vascular plant collection of Henry William Ravenel is now housed at the A. C. Moore Herbarium at the University of South Carolina. Ravenel achieved great respect as a 19th

Century scientist and botanist in his native state, South Carolina. The collection of approximately 6,000 specimens was previously located at Converse College in Spartanburg, South Carolina. About half of the collection consists of Southeastern material, with the rest from elsewhere in the United States and Europe. Ravenel's colleagues included American botanists S. T. Olney of Rhode Island, S. B. Mead of Illinois, E. Tatnell of Delaware, A. W. Chapman of Florida, M. A. Curtis of North Carolina, H. P. Startwell of New Jersey, Asa Gray of Harvard, and George Engelmann of St. Louis, several of whom are heavily represented in the collection. Additionally, there is a substantial amount of Ravenel's personally collected material, most of which is from South Carolina, especially Berkeley and Aiken Counties. The collection itself is highly varied in the quality of preservation, the consistency of labeling, and even in mounting style and materials. The entire collection is being inventoried and assessed to identify specimens which require repair, remounting, or annotation, and those which are particularly noteworthy and therefore deserving further scrutiny. A few sheets have previously been labeled as type material; the recognition and further care of any heretofore "forgotten" type specimens will be of major importance within this project.

- 11 SEYMER, JENNIFER AND DWAYNE WISE. Department of Biological Sciences, Mississippi State University—Microtubule turnover and chromosome stretching in cockroach spermatocytes.

We have examined premetaphase bivalent stretching in spermatocytes at meiosis I in the American cockroach, *Periplaneta americana*. Time-lapse video and digital micrography of living spermatocytes reveals that bivalents can stretch and congress at the same time. In this work, we have tested the hypothesis that microtubule turnover is necessary to maintain the stretched condition. We treated testis follicles with taxol, which stabilizes microtubules and with nocodazole, which cause microtubules to disassemble. In both cases, we find that, after treatment, almost all bivalents were in the relaxed condition. We conclude that microtubule turnover is necessary for chromosome stretching, but contrary to expectation, microtubule disassembly does not lead to increased stretching. We discuss the results in the light of current models of chromosome movement.

- 12 CARIVEAU, MICKAEL J., GERHARD KALMUS, RON ALLISON AND ROBERTA JOHNKE. East Carolina University—Cyclin dependent mitotic delay is correlated with DNA double strand break formation in the x-irradiated NIH3T3 fibroblast.

Molecular responses to radiation induced double strand breaks (DSB) are mediated by the phosphorylation of the histone variant H2AX which forms identifiable foci at the site of the DSB. This event is thought to be linked to the downregulation of signaling proteins contributing to the checkpoints that regulate cell cycle progression and, *vis-à-vis*, the induction of mitotic delay. However, it is unclear whether these cellular responses are directly related to the number of DSB (γ -H2AX foci) sustained by an irradiated cell and, if so, whether this number drives cells into division delay or apoptosis. For this reason, studies were conducted in the immortalized NIH3T3 fibroblast cell in order to establish correlations between the temporal appearance of the γ -H2AX foci (a DSB) and the expression of the cell cycle regulatory proteins, cyclin B1, cyclin A, cyclin E, and their cyclin kinase inhibitor, p21. Autoradiographic and flow cytometric analysis projected a mitotic delay of 2.65 min/cGy. Correlations between the expression of cyclin B1, cyclin E, cyclin A, p21, and the generation of DSB were established in cells exposed to 2.0 or 4.0Gy x-irradiation. The data was consistent with a correlative paradigm between the temporal appearance of the DSB and the downregulation of cyclin B1 and the upregulation of p21 while no correlation was observed between DSB formation and cyclin E or cyclin A inhibition. The data collectively suggests that, unlike the dose dependent

delay observed at the G1/S transition, a threshold level of DSB mediates cyclin dependent mitotic delay at G₂/M.

- 13 DIEHL, WALTER J. AND J. DEE PERKINS. Mississippi State University—Patterns of natural selection in the genome of Mycoplasmatales depend on gene function.

According to Kimura's neutral hypothesis, most mutations are either deleterious and subject to purifying selection or selectively neutral. Although confirmed within species, this hypothesis has never been tested adequately between divergent species where natural selection is likely most important. We tested the null hypotheses (1) that genes evolve neutrally both within and between clades and (2) that patterns of selection are independent of gene function. Nucleotide sequences for the entire protein-coding genome common to four species in the bacterial Order Mycoplasmatales (n=227 genes) were obtained from NCBI (Genbank, June 2002), re-aligned from amino acid alignments, and analyzed for natural selection using rate of non-synonymous/synonymous substitution ratios (dN/dS) and neutrality indices from McDonald-Kreitman tests. Potential biases of codon usage, GC content, mutation saturation, and selective sweeps were eliminated by applying Bonferroni corrections for type-I errors ($\alpha=0.0002$). Eighty-three genes simultaneously showed purifying selection and adaptive fixation of advantageous mutations between species; 65 genes showed purifying selection alone; 37 genes showed adaptive fixation alone; and 42 genes were neutral. The pattern of natural selection depended significantly (X^2 Prob<0.02) on gene function. Metabolic genes tended to be neutral. Information storage and processing genes tended to show purifying selection indicating that they have been conserved. Cellular process genes tended to show adaptive fixation indicating that they have contributed to divergence of these species. Selection favoring advantageous mutations associated with speciation may be more common than predicted by neutral theory. Supported by NSF.

- 14 AYALA, JANINY AND CHRISTI MAGRATH. Troy University—Replication from a transcription termination deficient ARS element.

Replication in *Saccharomyces cerevisiae* depends upon autonomous replication sequence (ARS) elements. A single point mutation introduced to ARS305 greatly reduces the transcription termination capacity of the genomic segment. Preliminary results indicate that in an extrachromosomal (plasmid) context this mutation does not effect replication in the absence of transcription. However, when transcription is directed into the mutated ARS305, replication is negatively effected. Additionally, introduction of the ARS305 mutation into the chromosomal locus will allow the effect of the transcription termination on replication in a chromosomal context to be assessed. By analyzing the replication status of transcription termination deficient mutants, the interrelation between replication and transcription termination will be better defined. This work supported by NSF CAREER Grant 9985156 (to CM).

- 15 ROE, KEVIN J.¹ AND BERNARD R. KUHAJDA². Delaware Museum of Natural History¹ and University of Alabama²—Conservation genetics and molecular systematics of the endangered Alabama Cave Shrimp (*Palaemonias alabamae*) (Decapoda: Atyidae) and a new species of cave shrimp in northwestern Alabama.

The family Atyidae is large and cosmopolitan in distribution, including both surface (epigean) and cave dwelling (stygobitic) forms. Historically, only two named species, the endangered Kentucky Cave Shrimp (*Palaemonias ganteri*) and the endangered Alabama Cave Shrimp (*P. alabamae*) were known from the southeastern United States. Recently however, an undescribed third species (*Palaemonias* sp.) of cave shrimp was discovered

from two localities in northwestern Alabama. The discovery of a new species of cave shrimp in Alabama raises questions concerning the true diversity of cave dwelling atyids in the southeastern United States. Due to their small size, cave shrimps may often go undetected unless they are actively searched for. Additionally, populations separated by a relatively short distance have been shown to be very distinct, both morphologically and genetically. Only 80 km separate the Alabama Cave Shrimp from the newly discovered species, yet we have found rather significant genetic divergence (over 4%) between these two species in a portion of the cytochrome oxidase c gene. This compares to the relative low genetic diversity found within both the Alabama Cave Shrimp and the new species (0.5% and 0% respectively). Based on phylogenetic analyses of cytochrome oxidase c sequence data, these two Alabama cave atyids are the sister group to other species within this shrimp family. Furthermore, cave shrimp from Mexico are more closely related to epigean atyids found in freshwater streams on the Pacific slope of North America than to the Alabama cave shrimp species.

- 16 JACOB, NITYA P.¹ AND L. MARK LAGRIMINI². Oxford College of Emory University¹ and Syngenta Biotechnology Inc.² —Comparative analysis of anionic peroxidase gene expression in *Nicotiana tomentosiformis* and in the allotetraploid *Nicotiana tabacum*.

Nicotiana tomentosiformis is the diploid paternal ancestor of *N. tabacum*, an allotetraploid. The genetic phenomenon of polyploidy occurs prominently in the plant kingdom. The effect of polyploidy on gene expression was examined in *N. tabacum*, specifically focusing on an anionic peroxidase gene. Anionic peroxidase, an isozyme belonging to the class III subfamily of peroxidases, is abundant in the tobacco shoot system. An anionic peroxidase gene, *Tpod*, was isolated from the diploid *N. tomentosiformis*. Expression of *Tpod* was compared between *N. tomentosiformis* and *N. tabacum* via quantitative RT-PCR methods. The organ-specific pattern of *Tpod* expression is conserved in both the diploid and the allotetraploid. However, compared to *N. tomentosiformis*, *Tpod* expression is reduced by five-fold in the stem of *N. tabacum* and increased by 100-fold in *N. tabacum* leaves. In addition, *Tpod* acquires a developmentally regulated expression pattern in *N. tabacum* leaves, not seen in *N. tomentosiformis*. *Tpod* promoter activity was silenced in flowers and developing seeds of *N. tabacum* plants expressing the *Tpod* promoter fused to the β -glucuronidase (GUS) gene, and was predominantly seen in xylem tissue of the leaf and stem. *Spod* is a gene orthologue of *Tpod* that originates from *N. sylvestris*, the maternal ancestor of *N. tabacum*. *Tpod* expression was also compared to that of *Spod* in *N. tabacum*. Biased expression of *Spod* was observed in mature leaves. *Tpod* contains fewer regulatory promoter elements compared to *Spod*. The results of this study suggest that altered interaction of regulatory networks in the allotetraploid impacts the expression of *Tpod*.

- 17 JIANG, CHEN¹, GLENN M. COHEN¹ AND ERIC G. SPOKAS². TroyUniversity¹ and Rowan University²—Distribution patterns and cellular localization of alkaline phosphatase in zebrafish and mosquitofish gills.

Our objectives were two-fold: to 1) map the distribution patterns and cellular localization of alkaline phosphatase (ALP) in the secondary lamellae of zebrafish and mosquitofish gills and 2) evaluate possible presence of ALP isoforms. For enzyme cytochemistry, gills were fixed 2-6 hr in 4% paraformaldehyde (4° C) and immersed in a solution of naphthol AS-MX phosphate-stabilized diazonium salt (fast blue BB). We embedded the gills in Spurr epoxy and cut 1-2 μ sections from the blocks. For cellulose acetate gel electrophoresis, we froze gills in distilled water and thawed them to make a gill homogenate. We used Hebert and Beaton's recipe for ALP staining. Tetramisole (5 mM) served as the inhibitor for both cytochemical and electrophoretic controls. The gills' secondary lamellae epithelia are composed predominately of pavement cells (95%), with chloride cells and mucous cells

comprising the other 5%. Pillar cells serve as blood channels and attach to the overlying epithelial layers of the secondary lamellae. After exposure of the gills to the enzyme substrate solution, the pavement cells of zebrafish and mosquitofish remained clear and did not stain for ALP. However, the underlying pillar cells stained intensely for ALP as evidenced by the presence of a dark blue precipitate. The intense ALP staining stopped abruptly at the juncture between the secondary lamellae and primary lamellae; the afferent blood vessels stained lightly. We detected two bands (isoforms) on the cellulose acetate gels of both zebrafish and mosquitofish gills. Thus, ALP staining provides a potentially important marker of gill blood vessels

- 18 ROGERS-LOWERY, CONSTANCE L. AND RONALD V. DIMOCK, JR. Wake Forest University—Changes in protease activity of fish skin mucus during development of acquired resistance to larvae of freshwater mussels.

In order to metamorphose into juveniles, the larvae (glochidia) of freshwater mussels (Unionoida) must temporarily parasitize gills, fins, or other external structures of fish. We have recently demonstrated that bluegill sunfish (*Lepomis macrochirus*) develop acquired resistance to glochidia of the mussel *Utterbackia imbecillis* after 2 infections, resulting in reduction of successful metamorphosis during 3rd and 4th infections, and significantly fewer glochidia attaching to fish during a 4th infection. When a glochidium attaches to a fish, it is potentially exposed to innate immune factors in the fish skin mucus, including proteases. Here, we examine the changes in the composition and activity of proteases in mucus of bluegill over the course of multiple infections by glochidia. Zymograms of fish mucus treated with a suite of protease inhibitors revealed that the proteases in the mucus of naïve fish are primarily trypsin-like serine proteases. However, proteases in the mucus of fish infected 4 times with glochidia were primarily metallo-proteases. Overall protease activity, as determined by azocasein hydrolysis, was lower in mucus from 4th infection fish as compared to naïve fish, and protease levels varied inversely with the humoral antibody response that develops during the course of infection. Extract from glochidia inhibited serine proteases of fish mucus, similarly to soybean trypsin inhibitor, but did not affect metallo-proteases. This study suggests that alterations in protease activity of fish mucus may play a role in acquired resistance against glochidia.

- 19 RAYBURN, JAMES R., GALA L. BYNUM, GEORGE R. CLINE, FRANK A. ROMANO III AND MIJITABA HAMMISSOU. Jacksonville State University—Sperm morphology of the freshwater jellyfish *Craspedacusta sowerbyi*.

The freshwater jellyfish, *Craspedacusta sowerbyi* is found in local watersheds in northeast Alabama. Over the past 2 years we have surveyed freshwater jellyfish from two watersheds. Visitors to the Sam H. Hammer Reservoir reported hundreds of fresh water jellyfish this year; we collected 18. The Diveland Park site had few reports of jellyfish. We surveyed from Diveland Park over several months (June-October) and collected only 2 individuals during the 2004 season. This has been the fewest number of jellyfish seen in the last 3 years. Approximately thirty specimens over two years and two sites have been identified as male. Gender was determined by placing gonads from the jellyfish on a glass microscope slide and visual observation. During observation of the jellyfish sperm, interesting features and motion of the sperm were noted. Pictures of living sperm on slides were digitally captured and analyzed using image pro software. Pictures to calculate sperm speed were taken at ½ second intervals for 5 seconds. We measured distance moved by sperm head in µm. Sperm head length, width, flagella length and sperm velocity were measured. Sperm were approximately 7 µm long and 2 µm wide. Flagella length was greater than 3X the sperm head length. An interesting feature of some sperm was the hooked sperm head due to immature sperm or support cells.

- 20 FISCHER ROBERT U. Eastern Illinois University—Changes in bluegill life history in response to 35 years of thermal extremes.

Extreme environments provide the opportunity to evaluate population divergence in life history evolution in response to acute and chronic environmental perturbation. Bluegill were sampled from both a thermally impacted pond (Pond C) and an ambient habitat (Par Pond) located on the Savannah River Site near Aiken, South Carolina to determine the influence of 35 years of thermal extremes on life history patterns. Fish were collected using an electroshocking boat and then frozen and returned to the lab for later analysis. Otoliths were also removed from each bluegill and stored dry for determination of growth rate and age at first reproduction. In addition, gonads from spawning females were removed and stored in Gilson fluid for later analyses of the reproductive parameters of egg size and egg number. Bluegills from Par Pond exhibited increased growth rates and delayed maturity compared to bluegill from the heated site. The increase in growth rates and delayed sexual maturity may be a response to the increased juvenile bluegill mortality caused by the relatively large bass population occupying Par Pond. Fish from the heated site (Pond C) had a higher reproductive investment, and shorter life span than did bluegill from the ambient environment. The differences observed in Pond C bluegill might be a response to the unpredictable food resources and the relatively high mortality rate from thermal death. Thus, bluegill from both the heated (Pond C) and normothermic (Par Pond) sites have altered their life histories either genetically or phenotypically in response to site specific environmental factors.

- 21 WOODALL, AMY, KEVIN BUTLER AND BRUCE STALLSMITH. University of Alabama at Huntsville—Timing of reproductive effort in two shiner species, *Notropis asperifrons* and *N. stilbius*, in Alabama.

Life history details of many species of fish are still poorly known in the species-rich fish fauna of the southeastern United States. Two such species are the burrhead shiner, *Notropis asperifrons*, and the silverstripe shiner, *N. stilbius*. Both are endemic to the Mobile Basin, and both are found in Borden Creek in the upper Black Warrior system. This site is in the Sipsey Wilderness of the Bankhead National Forest in Alabama. To determine timing and patterns of reproductive effort, collections were made of as many as 20 individuals of each species at roughly four week intervals from March to September. Individuals were fixed in buffered formaldehyde before being identified to sex. Gonadal tissues were removed and weighed so that gonadal somatic index, GSI, could be determined as an indicator of reproductive condition. Gonadal tissue from a smaller number of individuals from each collection date, species and sex were dehydrated and stained for histological examination for a more precise assessment of reproductive condition, especially of females. Female GSI data averages for each collection indicate that burrheads peak in reproductive activity in April (16.28, N=5), while silverstripes peak in May (12.21, N=10). Both species still had elevated female GSI values on July 3 (burrheads 10.86, N=4, and silverstripes 9.94, N=10) but both had a sharp decline on July 31 (burrheads 5.63, N=5, and silverstripes 4.87, N=9) with further steep drops in August and September. Histological examination of ovarian tissues indicates both species are multiple spawners, typical of North American notropines.

- 22 KOIGI, RACHAEL N.¹, NEIL BILLINGTON¹ AND WILLIAM GARDNER². Troy University¹ and Montana Department of Fish, Wildlife and Parks²—Conservation genetics of Montana sauger.

Sauger (*Sander canadensis*) are native to Montana but have declined by 53% in rivers and 75% in tributaries since the late 1980s. Factors contributing to this decline include the effect of diversion dams, habitat loss, and hybridization with introduced walleye (*S. vitreus*). Previous studies reported hybridization between Montana sauger and walleye

ranging from 0-15%, but there was no information on genetic variation in Montana sauger. We used protein electrophoresis to detect hybridization and introgression between sauger and walleye in Montana, and to survey genetic variation in Montana sauger populations. Hybridization rates ranged from 0-10% in the Yellowstone River and 0-22% in the Missouri River. Hybridization with walleye is a serious threat to the genetic integrity of Montana sauger. Brood stock used for supplemental sauger stocking should be screened genetically to prevent spawning hybrids. Genetic variation in Montana sauger was found at two (*EST** and *SOD-2**) of 35 protein-coding loci screened. In addition, rare heterozygotes were found at *PGM-1**. Significant differences in allele frequencies were found among Montana sauger populations, Yellowstone River populations and among Missouri River populations at both *EST** and *SOD-2**. Sauger from the lower region of the Missouri River system including the lower Milk River were genetically different from other Montana sauger populations. In addition, populations from the upper Milk River were different from those in the lower Milk River. The existence of significant genetic population structure in Montana sauger suggests that these populations should be managed separately; stock transfers should not be conducted.

- 23 CREECH, RONALD E.¹, RON E. JENSEN², P. TAYLOR EZELL¹, NEIL BILLINGTON¹, JANET GASTON¹ AND TANYA J. JOHNSTON². Troy University¹ and Saskatchewan Environment²—Hybridization and introgression between sauger and walleye in Lake Diefenbaker, Saskatchewan, Canada.

Fisheries managers from Saskatchewan Environment have reported that sauger (*Sander canadensis*) and their suspected hybrids with walleye (*S. vitreus*) have been observed in the upper riverine section of Lake Diefenbaker, an impoundment on the South Saskatchewan River. Hybridization and introgression between sauger and walleye was examined in Lake Diefenbaker during the summer of 2004 by morphological and protein electrophoretic analysis. Fish were collected by gill nets between early June and late August. Fish were categorized as sauger, walleye or putative hybrids based on external morphology and on the number and length of their pyloric caecae. Liver and muscle samples were collected from each fish and frozen. Cellulose acetate electrophoresis was conducted at four diagnostic protein-coding loci (*ALAT** and *IDDH** from liver and *mMDH-1** and *PGM-1** from muscle) and two informative loci in sauger (*sMDH-3** and *PROT-3**, both from muscle). By morphology 121 fish were identified as walleye, 81 fish as sauger and 15 fish as putative hybrids. Seven percent of fish identified as sauger possessed walleye alleles and 4% of fish identified as walleye possessed sauger alleles; hence were hybrids. Of the fish that were identified as putative hybrids based on morphological examination, 40% were confirmed to have alleles of the other species, 53% were pure sauger, and 7% pure walleye by protein electrophoretic analysis. Fisheries managers must be aware that morphological examination is unreliable for separating walleye, sauger and their hybrids compared to protein electrophoresis. This has important implications if fish are to be spawned and the offspring stocked.

- 24 BLANCHARD, TOM, THOMAS PRATT, SHINGO EINAGA AND CHASE TAYLOR. University of Tennessee at Martin—Seasonal and annual differences in a fish assemblage within a flooded forest at Reelfoot Lake, TN.

The objectives of this study were to document fish species inhabiting a flooded forest along the margin of Reelfoot Lake and to assess seasonal and annual changes in species composition, diversity, and abundance. Monthly sampling was conducted from 22 April – 3 November 2003 and from 29 February 2004 – 30 January 2005. The study site was located on the Grassy Island Unit of the Reelfoot National Wildlife Refuge in Obion County in northwestern Tennessee. Throughout the study, a total of 19 species representing 12 families was collected. Although there were minor differences in species composition between 2003 collections and 2004/2005 collections, there were substantial annual

differences in relative abundance of some species. Seasonal differences in species composition, species diversity, and species richness were minimal for both years. There were, however substantial seasonal differences in total abundance for all species combined and total and relative abundance for specific species during both years of this study.

- 25 MOYER, GREGORY R.¹, BRIAN L SLOSS², IGOR MITROFANOV³, CAREY KRAJEWSKI⁴ AND NEIL BILLINGTON⁵. Oregon State University¹, University of Wisconsin-Stevens Point², Zoology Institute of Almaty Kazakhstan³, Southern Illinois University⁴, and Troy University⁵—Phylogenetic relationships among *Perca* species inferred from mitochondrial DNA sequence data.

There are three species in the genus *Perca* (Teleostei: Percidae): *P. fluviatilis*, *P. flavescens*, and *P. schrenki*. *Perca flavescens* (the North American yellow perch) and *P. fluviatilis* (the Eurasian perch) are so similar in morphology, physiology, behavior and ecology, that some ichthyologists have considered them to be the same species. The range of *P. schrenki* (the Balkhash perch) is adjacent to that of *P. fluviatilis*, but the two species are morphologically distinct. We estimated the phylogeny of these three species from sequences of the mitochondrial DNA cytochrome *b* and 12S ribosomal RNA genes. Mitochondrial DNA trees obtained by maximum-likelihood, Bayesian, and parsimony methods suggest that *P. schrenki* and *P. flavescens* are sisters apart from *P. fluviatilis* (99, 100, and 99% support values, respectively). These results conflict with pre-existing morphological and geographical data, and pose a challenge for understanding evolution within *Perca*. We hypothesize that genetic substructure present in a broadly distributed *Perca* ancestor, when sundered by late Pliocene or early Pleistocene glaciers, resulted in the present distributions and phylogenetic relationships among current *Perca* species.

- 26 SLOSS, BRIAN L¹, NEIL BILLINGTON² AND BROOKS M. BURR³. University of Wisconsin-Stevens Point¹, Troy University², and Southern Illinois University³—A molecular phylogeny of Etheostomatinae (Teleostei, Percidae) based on combined cytochrome *b* and 12S ribosomal RNA mitochondrial DNA sequence variation.

Phylogenetic relationships within Percidae have long been the topic of debate. Within the family, the vast majority of taxonomic diversity exists in Etheostomatinae, the North American darters. Numerous issues including morphological and behavioral convergence, putative rapid speciation events, the evolution of darter breeding systems, and inherent issues dealing with estimating taxonomically rich phylogenies complicate hypotheses of evolutionary relationships among the darters. Recent molecular systematic investigations have yielded intriguing insights into the intrageneric relations of Etheostomatinae. In an effort to further investigate the evolutionary relationships among darters, we collected DNA sequence data from two mitochondrially-encoded genes (cytochrome *b* and 12S rRNA) for 46 taxa of Etheostomatinae. Taxonomic sampling included all nine subgenera of *Percina*, 15 of the 17 currently recognized subgenera of *Etheostoma*, two species of *Ammocrypta*, and *Crystallaria asprella*. Phylogenetic analyses were conducted using maximum parsimony, maximum likelihood, and Bayesian methods. All trees were rooted with non-darter percid taxa including representatives of *Gymnocephalus*, *Perca*, *Sander*, and/or *Zingel*. Resolution of darter phylogenetic relations, as determined by bootstrap values of resolved nodes, was improved through the combination of the two mitochondrial genes. Currently recognized generic relationships were supported in a majority of analyses except for *Etheostoma*. *Nothonotus* was paraphyletic in all recovered trees due to the recovery of *E. cinereum* apart from the other members of the subgenus. The molecular dynamics of cytochrome *b* poses a challenge in resolving relationships within Etheostomatinae due to saturation of third codon positions and apparent rate variation.

- 27 SHARDO, JUDITH D. Middle Tennessee State University—Neurulation in teleost fishes: a derived character.

The neural axis is one of the first structures to form during vertebrate embryonic development. The process of neurulation results in the formation of a neural tube, which later differentiates into the brain and spinal cord. There are two basic patterns of neural tube formation in vertebrates: 1) the formation of a neural groove with lateral folds that fuse along a dorsal midline to form a tube, as seen in most vertebrates; and 2) the initial formation of a solid neural rod that later cavitates, as seen in teleosts. In teleosts neural tube formation begins shortly after the notochord forms. The epiblast layer (future ectoderm) forms a thick neural plate with a ventral ridge. The neural ridge continues to thicken, forming a deep neural keel in the cranial portion of the embryo while the caudal portion remains broad and shallow. Both portions are solid. Cells of the neural keel elongate medio-laterally and rearrange into two irregular columns. The majority of the cells appear to contact either the lateral or medial borders of the columns. Medially the two columns then separate to form a vertical, slit-like neural canal, which continues to widen during brain differentiation. This cavitation process starts cranially and proceeds caudally. The phylogenetic distribution of this character, neural tube formation by cavitation, indicates that it evolved in the ancestor of teleost fishes and may have evolved more than once among the vertebrates. Partially supported by NSF grant DEB-9707530 to J. Shardo.

- 28 HARRELSON, LANE AND STEPHEN C. LANDERS. Troy University—Protozoan parasites of the maldanid polychaete *Axiiothella mucosa*.

Axiiothella mucosa is a polychaete in the family Maldanidae, a group commonly known as bamboo worms. This polychaete is known to host a number of protozoan parasites, including the gregarine *Pterospira floridiensis*, the dinoflagellate *Haplozoon*, and a peritrich ciliate tentatively identified as *Paravorticella*. The purpose of this project was to analyze developmental stages and adults of *A. mucosa* for these parasites using plastic sectioning. Larvae at different stages of development and adult worms were embedded in plastic and sectioned (1 micron) for light microscopic analysis. Larval stages have not revealed signs of infection. Adult worms have revealed both gamont and gametocyst stages of the acephaline gregarine *Pterospira floridiensis* within the coelom of the host. Additionally, an unidentified gregarine was present in large numbers within the intestinal wall. Further research will focus on the unidentified gregarine as well as dinoflagellate and ciliate infections known from the intestinal lumen.

- 29 AL-ZEIN, MOHAMMAD S¹ AND KHOUZAMA M KNIO². Old Dominion University¹, American University of Beirut²—Comparative morphometric studies of the cryptic and sympatric flower head-infesting tephritids, *Chaetostomella cylindrica* (Robineau-Desvoidy) and *C. lurida* (Loew).

A survey of flower head-infesting fruit flies in Lebanon, conducted between 1995 and 1998, showed the existence of eighteen species of fruit flies reared from twenty species of thistles (Asteraceae). Fifteen of these species were reported to occur for the first time in Lebanon, two of which are the highly oligophagous *Chaetostomella cylindrica* and the monophagous *C. lurida*. The two tephritids proved to be sympatric and cryptic, showing great morphological similarities. This study aims at separating these closely related species based on adult morphometric characteristics. Using principal component analysis and canonical discriminant analysis of seven morphometric traits, two head and five wing measurements, the two species were differentiated with more than 70% accuracy based on all or some of these measurements; furthermore, the aculeus apex angle and more significantly the aculeus length were very helpful in separating the females of both species. Since *Chaetostomella lurida* has been poorly described and its taxonomic status

is not clear, the biology, behavior and genetics of the two species need to be further studied before the status of *C. lurida* as a separate species can be resolved.

- 30 CHANNELL, KATHERINE AND THOMAS G. JONES. Marshall University—Implementation of a spatial-temporal focus to predict habitat locations and distribution of *Cambarus veteranus*.

*Crayfishes are the second most common species on the federal endangered species list. The type locality of *Cambarus veteranus* is Indian Creek of the Upper Guyandotte River drainage, Wyoming County, West Virginia. The species was last located in 2000, a single live specimen was located in Huff Creek, West Virginia. Two consecutive 100 year floods occurred in the watershed in 2001 and 2002. Stream channelization and habitat modification occurred on a massive scale. Recent surveys have not located a single live specimen. Thirty-eight percent of all streams in the Upper Guyandotte River drainage are impaired, a particular threat to *C. veteranus*. This impairment plays a role in the creation of habitat patches. Finding suitable habitat is advanced with the use of a geographic information system (GIS). Historical and current biological data provide the basis for suitable locations and prediction models. Suitability maps explain optimum habitat localities for *C. veteranus* in the Upper Guyandotte by means of ArcMap® 8.1 thematic maps, spatial and geostatistical analysis. Potential search area was 90% surveyed yet ground verification produced no new locations for *C. veteranus*.*

- 31 SWECKER, CASEY AND THOMAS G. JONES. Marshall University—Crayfish Distribution of the New River Gorge National River.

Orconectes virilis was first recorded in West Virginia from the New River in Summers County. The presence of this species is believed to be due to bait-bucket introduction. A researcher working below Bluestone Dam found three Orconectid species, *O. virilis*, *O. sanbornii*, and *O. cristavarius*. *Orconectes virilis* and *O. sanbornii* both introduced by the bait industry were observed in approximately equal numbers. During 2003, a general survey below the Bluestone Dam located only *O. virilis*. This invasion has been found in two other downstream tributaries of the New/Kanawha River. No native Orconectid crayfishes were found in either tributary. These findings led to a large scale resurvey of the New River in West Virginia. Twenty nine sites were visited which resulted in three cambarus and three Orconectes species located in the New River gorge area.

- 32 DIMOCK, RONALD V., JR.¹ AND DAVID C. ALDRIDGE², Wake Forest University¹ and University of Cambridge²—Something is very fishy about these mussels: the symbiosis of European bitterling and their unionid hosts.

The life cycle of most freshwater mussels (Bivalvia: Unionidae) includes a glochidium larva which must temporarily parasitize a fish host to complete its early development and metamorphosis. In a reversal of conventional vertebrate host - invertebrate symbiont associations, eggs of the European bitterling *Rhodeus sericeus* (Cyprinidae) are deposited in the interior of the gills of a mussel, within which fertilization and early development occur. Female bitterling insert an elongated ovipositor through a host mussel's exhalant siphon to place ova in water tubes of the mussel's gills. Males subsequently release sperm into the inhalant siphon of the host, effecting *in situ* fertilization. We have employed video endoscopy and Scanning Electron Microscopy to image the distribution and functional morphology of larval bitterling in the European mussel, *Unio pictorum*. Early embryos are located deep within the water tubes. The polarity of development results in larval fish being oriented head downward. Prominent lateral projections of the embryonic yolk sac become wedged into the tissue of the water tubes, probably facilitating retention of the developing larvae. Mechanical stimulation can induce rapid flexion of fish tails projecting into the mussel's suprabranchial cavity, as will

be evident from accompanying video. A cost to host mussels of harboring fish in respect to compromised irrigation of the gills and perhaps suspension feeding, although as yet undetermined, seems highly likely.

- 33 RICHARDS, BRIAN K., JOSHUA WESTBROOK, THOMAS G. JONES AND RALPH W. TAYLOR. Marshall University—Determining status and trends of the New River mussel community, New River Gorge National River, WV.

With the given decline of freshwater mussel (Unionidae) populations across North America, a survey of the New River within the New River Gorge National River was conducted from July 2003 to September 2004 from Bluestone Dam (Hinton, WV) to the mouth of Coal Run (Cunard, WV). With listings of threatened, endangered, and species of special concern, mussels of the New River have not been surveyed since 1984-85. The objectives were conducted by a two-phase survey to determine distribution, mussel density, changes in mussel density since the last survey conducted, and to determine if any other invasive alien species (Zebra mussel) occurs within the river. The first phase is area extensive, resulting in mapped mussel beds using Geographic Information Systems (GIS). Sites were searched by SCUBA and snorkeling, counting mussels within approximate areas of 50 X 100 meters for 26 sites resulting in 25.95 man-hours searched and over 2,700 mussels counted. The second phase is intensive surveys of selected mussel habitats from the first phase to determine mussel community composition. Second phase sites are searched by SCUBA and snorkel on 100 meter transect lines or area time searches. All live mussels were collected for digital imaging and weight measurements and returned to the substrate. Dead shell was collected and measured to determine if there are correlations to size or age and the life span of collected species.

- 34 HANNA, CHADWICK J. AND VINCENT A. COBB. Middle Tennessee State University—Thermal effects on green lynx spider egg sacs and hatching.

In the summers of 2003 and 2004, the egg sacs of sixty-one gravid green lynx spiders, (*Peucetia viridans*) were collected and placed in a constant temperature treatment of 15, 17.5, 20, 25, 30, 32.5 or 35°C. Hatching time was recorded for each treatment and used to show the relationship between incubation temperature and hatching time. Hatching time was inversely proportional to temperature, and no hatching occurred at 17.5 or 35°C. In the field, temperatures of 37 egg sacs were recorded until hatching or predation. The mean temperature of field egg sacs was $20.0 \pm 0.6^\circ\text{C}$ and average time until hatching was 30.8 ± 0.8 days. Field measurements of hatching time closely matched the laboratory estimates for the given temperature. To measure the potential temperature extremes available for egg sac placement physical egg sac models were placed at heights of 0.1, 0.5, and 1.0m in full shade, and at 0.1, 0.5, and 1.0m in full sun. The model temperature extremes ranged from -0.1 to 44.6°C. These data show that egg sacs have the potential to encounter a wide range of temperatures during their development, and that variations in climate and egg sac placement may affect the hatching time of green lynx spider egg sacs.

- 35 SNYDER, JOHN. Furman University—A checklist and database describing South Carolina Moth Species.

South Carolina, a state with much geographical diversity, should harbor many moth species. Recognizing that a comprehensive tool for cataloging historical and current moth diversity had not been constructed, I gathered data from all appropriate regional and national collections along with published records and built a web-accessible database and state checklist. An ongoing project, it is currently composed of records from 9,500 specimens chosen on the basis of taxon, county of collection, and date of collection. A total of 1,512 species, representing 39 families, have been documented within the state.

Of the state's 46 counties, only 5 provided more than 100 records. Three counties are not represented by any specimens placed into accessible collections and 22 others have provided less than 10 specimens each. Fortunately, those 5 most heavily-surveyed counties represent distinctly different biogeographic regions, including ocean front, inner coastal plain, piedmont, and the Blue Ridge. Seventy-one percent of the species that should be found in South Carolina (according to literature sources) have actually been recorded. There are 253 species occupying the state that were not anticipated from literature accounts and should thus be investigated as demonstrating possible range extensions. Many museum records are old, with only 12% in the database having collection dates from the last decade and over 75% from earlier than 1977. Records from this work have become part of the state's Comprehensive Wildlife Conservation Plan. The database and checklist described here can be accessed at <http://facweb.furman.edu/~snyderjohn/sc-moths/>.

- 36 FIELDS, CHRIS AND RODNEY BEASLEY. New Site High School, New Site, MS
—First record of *Sphodros rufipes* from northern Mississippi.

A new record for the distribution of the purseweb spider, *Sphodros rufipes* (Atypidae) is reported from Tippah County, Mississippi. This represents the first report for this taxon from northern Mississippi and only the third report from the state. Previously, it has been reported from Forrest County and Hinds County in southern Mississippi. A voucher specimen has been deposited at the American Museum of Natural History.

- 37 GREEN, J. JEFFREY AND VINCENT A. COBB. Middle Tennessee State University—Body temperature selection of black racers (*Coluber constrictor*) in Middle Tennessee.

This study investigated daily body temperature patterns of 12 free-ranging black racers (*Coluber constrictor*) in Middle Tennessee. Snake body temperatures (T_b) were recorded every 30 min for periods of 7 – 84 days between May and October of 2003 and 2004. Using frequency data of daytime T_b , we determined *C. constrictor* to have a preferred body temperature (T_p) range of 30 - 36°C. Between May and October of 2004 snake thermal physical models were placed randomly in four different habitat types to describe variation in available operative temperatures. Operative temperatures ranged from 15 - 65°C for the various habitat types and frequently overlapped suggesting snakes could encounter a wide thermal gradient in any habitat. However, each habitat offered a different amount of time during the active period (0700 – 1900 hrs) for *C. constrictor* to thermoregulate within its T_p range. In the spring, hardwood forests offered the least amount of time (4 - 5 hrs) for thermoregulation within the T_p range while cedar fields offered the most (10 hrs). By mid summer, all four habitats offered similar times available within the T_p range of *C. constrictor* but were restrictive in that only 19 – 29% of the space within the habitats provided adequate temperatures. These data indicate the thermal environments of different habitats can vary considerably and at times provide little opportunity for snakes to maintain T_b within their preferred range. These different thermal opportunities imply that thermoregulatory behavior within a habitat type can vary from being a thermoconformer to a strong thermoregulator.

- 38 LOUGHMAN, ZACHARY J. AND THOMAS K. PAULEY. Marshall University—Snake community dynamics of a reclaimed mine land in Southern West Virginia.

Surface mining in Appalachian ecological systems have received considerable biological investigations in recent years because of the environmental consequences present at the initiation of mining activities, and effects on biodiversity while coal is harvested. Reclamation effects on repatriation of native species into reclaimed mine lands have received little attention; with reptile repatriation rates receiving no scientific investigation.

Snake assemblages at six distinct macrohabitat types (high wall, successional forest, plain, retention pond, marsh, railroad cut) were surveyed on a 25-year post reclamation contour surface mine in Raleigh County, West Virginia. Survey methods included drift fence arrays, trapping, and haphazard searches. Macrohabitats were surveyed for 20 investigator hours, and snake per unit effort (snakes/hour) values were calculated. Five of 12 snake species known to be present in Raleigh County were discovered inhabiting the reclaimed mine lands. Habitat types with higher amounts of habitat complexity (high wall) resulted in more diversity than habitat types with low habitat complexity (plain). Snake per unit effort values were highest in macrohabitats with high levels of habitat complexity (high wall), or where habitat specialists were present (*Nerodia s. sipedon*). Overall snake diversity values for the reclaimed mine land (5 species) were lower than control values from a disturbed natural area (Gauley National River = 11 species), indicating reclamation practices were insufficient for repatriation to occur.

- 39 WILLSON, JOHN D.¹, CHRISTOPHER T. WINNE¹, MICHAEL E. DORCAS² AND J. WHITFIELD GIBBONS¹. Savannah River Ecology Laboratory¹ and Davidson College²—Post-drought responses of semi-aquatic snakes inhabiting an isolated wetland: insights on different strategies for persisting in a dynamic habitat.

Many habitats are temporally dynamic, prompting the evolution of diverse strategies to persist in the face of fluctuating environmental conditions. Isolated wetlands in the southeastern United States harbor high diversities and abundances of aquatic and semi-aquatic organisms. However, drought may render wetlands temporarily unsuitable for some species, sometimes for years at a time. Ellenton Bay, an isolated 10-ha wetland in the Upper Coastal Plain of South Carolina, has hosted several long-term studies of the responses of semi-aquatic reptiles and amphibians to periodic extreme droughts. We studied the movement patterns and demography of seven species of semi-aquatic snakes at Ellenton Bay following complete drying of the bay during a drought from 2000 to 2003. Snakes adopted multiple strategies to persist during the drought and apparently fared differently as a result: *Agkistrodon piscivorus* migrated to and from the wetland annually, fared well, and reproduced during the drought; *Nerodia fasciata* suffered dramatic population declines and apparently did not reproduce, and *N. floridana* was locally extirpated during the drought; *Seminatrix pygaea* aestivated within the wetland and was less negatively affected by the drought than *Nerodia*. Intraspecific differences in response to drought demonstrate that conservation measures may affect species differently and highlight the importance of terrestrial habitat around wetlands for semi-aquatic reptiles.

- 40 WINNE, CHRISTOPHER T. AND J. WHITFIELD GIBBONS. University of Georgia's Savannah River Ecology Laboratory—Adaptations of a small aquatic snake (*Seminatrix pygaea*) to a dynamic habitat: selection on body size and reproduction after aestivating during drought.

Organisms inhabiting temporary wetlands must be evolutionarily equipped both to survive periodic droughts and to take advantage of seasonal and yearly fluctuations in their prey base and convert that energy intake into successful offspring. The drought survival strategy and reproductive ecology of a small species of semi-aquatic snake (*Seminatrix pygaea*) in an isolated wetland were investigated during the first wet year following a severe drought. Terrestrial drift fence and aquatic trapping data demonstrated that *S. pygaea* remained in aestivation within the dried wetland during the drought. Following the drought, the smallest and largest size classes were absent from the population, suggesting a lack of recruitment during the drought years and selection on body size during long-term aestivation. Nonetheless, during the first wet year following the drought *S. pygaea* capitalized on the abundance of amphibian prey and accrued enough energetic resources to reproduce with the same frequency as in years prior to the drought. Larger females produced larger litters and offspring, suggesting that selection may favor larger

females in *S. pygaea* as is typically true of other sexually dimorphic snake species. However, selection during wet years for higher fecundity may be offset by selection for medium sized snakes during aestivation, thus constraining the degree to which sexual dimorphism and body size can increase in *S. pygaea*. Lastly, *S. pygaea* may be atypical among snakes because they readily eat during pregnancy, a trait that may partly explain their unusual ecology and allow them to reproduce during wet years subsequent to extreme droughts.

- 41 SMITH, DANNA AND CARL QUALLS. University of Southern Mississippi—Habitat associations of herpetofaunal sandhill communities in southern Mississippi.

The habitat associations of reptiles and amphibians endemic to xeric sandhill communities in southern Mississippi are scantily studied and poorly understood. Many species indicative of these communities are both fossorial and elusive, thus difficult to capture and study. Some examples of upland sandhill species include the scarlet snake (*Cemophora coccinea*), eastern spadefoot toad (*Scaphiopus holbrookii holbrookii*), black pine snake (*Pituophis melanoleucus lodingi*) and mimic glass lizard (*Ophisaurus mimicus*). From March through July 2004, twenty-two upland sandhill sites located in ten counties were surveyed in southern Mississippi. Drift fence arrays with pitfall and funnel traps, manual searching, cover boards and road cruising were used to survey each site. In total, thirty-five reptile species (502 individuals) and eighteen amphibian species (853 individuals) were surveyed during this period. For each site, the following habitat characteristics were collected and quantified: basal area, recency of fire, slope, percent sand, silt and clay content of soil, percent canopy cover, percent mid-story coverage, percent forbs, grasses, shrubs, woody vines, bare soil and leaf litter comprising groundcover, and dominant overstory, mid-story, and shrub species. The herpetofaunal abundance and diversity for each site and the quantified habitat variables were analyzed to determine what species occur in association with different habitat characteristics. By better defining the faunal-habitat relationships of these communities, the life history and biology of many sandhill species may be better understood.

- 42 FOGUS, TERESA M.¹, ZACHARY LOUGHMAN¹, JAIME SIAS¹, S. DOUGLAS KAYLOR¹, MARK B. WATSON² AND THOMAS K. PAULEY¹. Marshall University¹ and the University of Charleston²—Amphibian and reptile inventories of the Gauley River National Recreation Area.

Inventories to determine amphibian and reptile species that occur in the Gauley River National Recreation Area (GARI) were conducted from 2000 to 2004. Presence of species was determined with auditory and visual observations. All available terrestrial and aquatic habitats were inventoried throughout the four-year period. Total species counts were: salamanders (17 species), frogs (7 species), toads (2 species), turtles (5 species), lizards (3 species), and snakes (12 species). Several species observed throughout the study are classified by the West Virginia Division of Natural Resources as species of concern. These include four salamander species (the Jefferson Salamander – *Ambystoma jeffersonianum*, Black-bellied Salamander – *Desmognathus quadramaculatus*, Green Salamander – *Aneides aeneus*, Northern Red Salamander – *Pseudotriton r. ruber*), two turtle species (the Northern Map Turtle – *Graptemys geographica* and River Cooter – *Pseudemys concinna*), one lizard species (the Broad-headed Skink – *Eumeces laticeps*), and two snake species (the Wormsnake – *Carphophis amoenus* and Timber Rattlesnake – *Crotalus horridus*). All data was entered into a Microsoft Access database and mapped using ESRI ArcMap to show spatial distribution of each species. Based on number of locations searched, the habitat of a particular location, and the species found in each site, we can determine what, if any, precautions need to be taken to protect this National Recreation Area. This study suggests the GARI supports not only high levels of

biodiversity, but also fragile habitats with many species of special concern. Funded by the National Park Service.

- 43 RYAN, BUCKY AND TRAVIS PERRY. Furman University—Comparing reptile and amphibian communities between two forest types using large and small coverboards.

Coverboards are commonly used to estimate species richness, abundance, and diversity in reptile and amphibian communities. In this study we examined communities in two forest types and compared effectiveness of coverboard size. Forty each of 3,700 cm² (small) and 14,864 cm² (large) boards were distributed between adjacent hardwood and pine forest in Autauga County, Alabama. Boards were checked 13 times over the duration of 2 months. On each occasion, species under boards were identified and counted. Wind speed, cloud cover, temperature, amount of last rain, days since last rain and time of day were also recorded. Data were analyzed using ANOVA and Chi-squared statistical tests to compare species composition, abundance, richness, and diversity between forest types and board sizes. An ANCOVA analysis was performed to determine whether there was a significant difference between cover board sizes with respect to the rate at which new species are found in a particular habitat. Significantly more herpetiles were collected in hardwood forest for both board sizes. No significant correlations were found between any of the environmental factors and herpetile abundance, diversity, or species richness under coverboards. The rate of new species discoveries was fastest under large coverboards.

- 44 MERRITT, DEBORAH¹, THOMAS PAULEY¹, JOHN MAERZ² AND JAMES KOCHENDERFER³. Marshall University¹, Cornell University² and US Forest Service³—Amphibian use of man-made pools in clear-cut forests.

Timber harvesting can change and for some species degrade wildlife habitat; so, information on practices that can alleviate forestry impacts is needed. Pools were constructed in 1993 on primitive roads in clear-cut sections of forest on McGowan Mountain, Tucker County, West Virginia. In 1993 and 1994, we used monthly samples (April through September) of water conditions and amphibian captures to evaluate amphibian use of 22 man-made pools. Anurans that utilized the pools to breed were *Bufo a. americanus*, *Rana sylvatica*, *Pseudacris brachyphona*, and *Hyla chrysoscelis*. Two species; *Desmognathus ochrophaeus*, and *Gyrinophilus p. porphyriticus*, inhabited but did not breed in the pools. By 1994, 14 of 22 pools were used by anurans to breed. Anurans only bred in pools that retained water throughout the larval period. The number of anuran species that bred in a pool was determined primarily by pond depth. This study suggests that construction of small but deep pools placed carefully such that their hydroperiods are not too short for complete larval development (i.e., near seepages) provide breeding habitat for some frog species as well as refugia and foraging sites for some non-breeding frog and salamander species in clear-cut areas. Pools constructed at strategic locations on primitive roads have the potential to reduce adverse impacts of timber harvesting on some amphibian populations.

- 45 ROTHERMEL, BETSIE B., THOMAS M. LUHRING, BRIAN D. TODD, BRIAN S. METTS, GABRIELLE J. GRAETER AND J. WHITFIELD GIBBONS. Savannah River Ecology Lab, University of Georgia—Preliminary results of an experimental study of salamander (*Ambystoma* spp.) responses to intensive forest management.

Clearcutting and other forestry practices that remove canopy and disturb ground cover often lead to decreases in abundance of amphibians, especially salamanders. In spring of 2004, we conducted experimental timber harvests around four wetlands on the Savannah River Site. At each wetland, we created four 10-acre plots that were randomly assigned to

one of four treatments: clearcutting with CWD removed, clearcutting with CWD retained, thinning, and unharvested control of mature loblolly pine. Using drift fence-pitfall trap arrays, we found significant differences among treatments in the number of captures of salamanders during the first year post-harvest. We examined salamander desiccation risk by placing juvenile mole salamanders (*Ambystoma talpoideum*; $n = 41$) in small enclosures at one site in July 2004. Half of the salamanders in each treatment were provided with artificial burrows. We recorded burrow use and measured the weight of salamanders at 12-hr intervals over a 72-hr period, using percentage of weight lost as a measure of dehydration. Dehydration was significantly higher in the clearcut with CWD retained than in the other three treatments. Only 40% of salamanders without burrows survived in the clearcuts, versus 90% in the thinned stand and 100% in the control. Ninety percent of the salamanders with access to a burrow survived in the clearcuts versus 100% in the thinning and control. We attribute higher desiccation rates in the clearcuts to high temperatures. Although habitat changes due to thinning did not lead to increased desiccation, complete canopy removal greatly increased risk of mortality due to desiccation.

- 46 GRAHAM, JAMES, GARY WALKER, RAY WILLIAMS, ZACK MURRELL AND ART REX. Appalachian State University—Hemlock ecosystems and spatial patterns of hemlock woolly adelgid infestation in northwestern North Carolina.

Hemlock ecosystems and associated plant assemblages are at risk of decline in the Southern Appalachians. Grandfather Mountain, Linville, Lutherock and northern Watauga County in North Carolina harbor excellent examples of these ecosystems. If not suppressed, *Adelges tsugae*, the hemlock woolly adelgid (HWA), may facilitate the destruction of native hemlocks in the Southern Appalachians. Hemlock woolly adelgid has infested over one-half of the eastern hemlock's range within the United States. The goals of this project are: 1) to identify biotic and abiotic interrelationships within hemlock ecosystems, 2) to develop a methodology for permanently monitoring hemlock ecosystems, and 3) to assist the surrounding communities in employing an effective system for conserving biodiversity in hemlock ecosystems using Geographic Information Systems (GIS). Study sites are located in 10 hemlock forests in 3 localities to maximize combinations of age, elevation, slope, and aspect. Surveys were conducted at these sites using the North Carolina Vegetation Survey methodology, with the addition of woody seedling surveys, arthropod inventories and age class analysis. The results indicate that there are unique plant assemblages within these hemlock ecosystems. High HWA infestation levels within these ecosystems are concentrated in areas closest to roads and streams. Plots surveyed at the highest elevations had lower HWA infestation levels than those at lower elevations. Because most hemlock forests are infested with HWA, results from this study can be used as a reference by researchers, land managers, and conservationists to prioritize Southern Appalachian hemlock ecosystems for conservation and/or restoration.

- 47 COLEMAN, DWAYNE E., CHRIS MEYER, PATRICK DWYER AND NICOLE TURRILL WELCH. Middle Tennessee State University—Seasonal changes in herb layer cover and species composition in Table Mountain pine (*Pinus pungens* Lamb.) forests of the Great Smoky Mountains National Park, Tennessee.

This study examined seasonal changes in herb layer cover and species composition in two *Pinus pungens* stands in the Great Smoky Mountains National Park: a 3-year old stand near the Foothills Parkway (FHP) and a > 60 year old stand on Bote Mountain (BM). In May, July, and October 2004, percent cover of all herb layer species (all vascular plants, woody and herbaceous, ≤ 1 m in height) was assessed in 5 1-m² plots randomly located within each of 8 permanent 100-m² plots. There were significant ($P < 0.05$)

seasonal changes in mean percent cover for FHP (48.5%/m² in May, 88.5%/m² in July, and 59.8%/m² in October) but not for BM (63.2%/m² in May, 68.6%/m² in July, and 60.6%/m² in October). Importance values for the herb layer species were calculated as relative cover plus relative frequency. Dominant species at FHP were *Smilax glauca*, *P. pungens*, and *Erechtites hieracifolia* whereas *Gaylussacia ursina*, *Gaultheria procumbens*, and *Vaccinium pallidum* were dominant at BM. Dominant species did not change seasonally for either site. Herb layer species richness was 7.9, 7.9, and 6.5 species/m² for FHP and 4.0, 4.0, and 3.8 species/m² for BM, for May, July and October, respectively. These findings suggest that fire is not only necessary to maintain *P. pungens* stands, but also the diversity of shade-intolerant herb layer species common in more open-canopy, younger stands as opposed to closed-canopy older stands.

- 48 WELCH, NICOLE TURRILL, DWAYNE COLEMAN AND CHRIS MEYER. Middle Tennessee State University—Post-wildfire regeneration of *Pinus pungens* in the Cherokee National Forest, Tennessee.

Pinus pungens (Lamb.), table mountain pine, is a fire-dependent endemic of the southern Appalachian Mountains. Seventy years of fire suppression in this region have increased the presence of hardwood species in many *P. pungens* ecosystems, and post-wildfire and post-prescribed fire regeneration of *P. pungens* often is poor in these later successional stands. This study examined *P. pungens* regeneration following the November 2001 Green Mountain Fire in the Cherokee National Forest. Species and diameter breast height (dbh) were recorded for canopy stems in eight 100-m² permanent plots in May 2004. Seedling density was assessed in five 1-m² subplots randomly located within each permanent plot. Observations of standing dead revealed that *P. virginiana* (12.97 m²/ha), *P. pungens* (12.82 m²/ha), *P. rigida* (4.46 m²/ha), and *Nyssa sylvatica* (1.15 m²/ha) were the dominant canopy species before the fire. Most stems of *P. virginiana* were < 25 cm dbh whereas most stems of *P. pungens* were > 20 cm dbh; stems of hardwood species were < 15 cm dbh. There was no significant difference in the mean number of pine and hardwood seedlings three years after the fire, 23,900±16,000 and 23,000±26,400 seedlings/ha, respectively. *P. pungens* regenerated well (29,700 seedlings/ha), and better than the other pine species; *Oxydendron arboreum* and *Acer rubrum* produced 34,800 and 19,200 seedlings or sprouts/ha, respectively. *P. pungens* regeneration was such that it should retain its dominance on this steep, rocky, shallow-soil site.

- 49 LUKEN, JAMES O. Coastal Carolina University—Establishment and release of Venus' fly traps in mowed clearings on the rims of Carolina bays.

The Venus' fly trap (*Dionaea muscipula*) is a relatively rare, carnivorous plant occurring often in open habitats associated with the rims of Carolina bays. Without frequent fire, vegetation on bay rims becomes dominated by tall, evergreen shrubs and Venus' fly traps decline. This project examined the utility of mechanical mowing, soil clearing, transplanting, and seeding as an experimental approach to create new populations of Venus' fly traps at Lewis Ocean Bay Heritage Preserve, SC, when prescribed fire is precluded. Mowing of dense shrub communities in spring, 2003 produced open sites with little or no ground-layer vegetation. After two growing seasons, adult Venus' fly traps transplanted to mowed areas showed high survivorship and relatively large petioles. Suppressed or dormant Venus' fly traps existing on-site quickly initiated growth in response to mowing. These volunteers and the transplants had higher flowering percentages than plants in reference populations. Seeds of Venus' fly traps were scattered in mowed and cleared plots. Seedling establishment was low but seedlings persisted into the second growing season. Mowing and clearing facilitated establishment of two other carnivorous species, *Drosera capillaris* and *Utricularia subulata*, but also allowed invasion by *Juncus scirpoides* and three other monocots. Mowing of dense shrub vegetation created suitable habitat for growth of adult Venus' fly traps. However,

maintaining persistent openings on the rims of Carolina bays will be an ongoing challenge due to availability of potential invaders and rapid growth of regenerating shrubs.

- 50 PIERCE, SAM AND MACIEJ BIERNACKI. University of Memphis—Predicting flowering time in lilacs: a heat accumulation model.

Heat accumulation models are used in a variety of studies of plant growth and development. The basic premise of heat accumulation in plants is that developmental rate is dependent upon a direct relationship with environmental temperature measures. A large number of these models have been developed for estimation of timing of developmental stages like flowering and fruiting. These models generally have not accurately accounted for the physiological differences in day temperatures and night temperatures or, in the case of perennials, have failed to account for the effects of temperature during the previous year's growing season. We will use several decades of phenological and meteorological data to demonstrate the utility of a new heat accumulation model for predicting timing of plant reproduction. We will be presenting preliminary data analysis on two species of lilac, *Syringa vulgaris* and *Syringa chinensis*, whose range extends over much of the contiguous United States.

- 51 NEAL, REBECCA¹, KEVIN BRINCK², PAUL BANKO², MARTIN CIPOLLINI¹ AND GARY BRETON. Berry College¹ and USGS Pacific Island Ecosystems Research Center²—Intraspecific variation in quinolizidine alkaloids of mamane (*Sophora chrysophylla*) seed embryos: relevance to specialist seed predation by palila (*Loxioides bailleui*) and *Cydia* spp.

The endangered bird palila (*Loxioides bailleui*) and seed-predator moths (*Cydia* spp.) are dependent upon seeds of mamane (*Sophora chrysophylla*) on the island of Hawaii. Palila ingest high numbers of embryos (especially during the breeding season) while *Cydia* larvae feed exclusively within the embryos. While the embryos are lipid, protein and mineral rich, they also contain levels of quinolizidine alkaloids (QAs) toxic to most organisms. Neither palila nor *Cydia* show obvious adverse effects from embryo ingestion. It is however possible that embryos vary in QA content and that palila and *Cydia* can avoid high levels of alkaloids while feeding (they show preferences for certain trees in the field). We addressed this issue by examining variation in 16 QAs in embryos within pods collected from 41 trees across four fruiting seasons at two field sites. Individual seeds were quantitatively analyzed for QA content using GLC. Data reduction was applied (principle components analysis) to eliminate problems of collinearity (most QAs were correlated). Overall QA levels varied among seasons and with elevation. The first principle component correlated negatively with elevation and with most alkaloids other than anagryne, while the second component segregated the data into qualitative QA profile types. Trees within a sampling season did not vary significantly from one another, yet tended to vary in QA profile across seasons. While it is unlikely that either palila or *Cydia* can avoid alkaloids while feeding, it is also unlikely that the herbivores are capable of exerting selection pressure on individual mamane trees in manners that affect QA content.

- 52 WALCK, JEFFREY L.¹, JERRY M. BASKIN², CAROL C. BASKIN² AND SITI N. HIDAYATI¹. ¹Middle Tennessee State University and ²University of Kentucky—Defining transient and persistent seed banks based on germination seasons: ecological and evolutionary perspectives.

The most often used time-line for distinguishing a transient seed bank from a persistent seed bank is one calendar year. Thus, species whose seeds live in or on the soil for <1 yr have a transient seed bank, whereas those whose seeds live for ≥1 yr have a persistent seed bank. However, dormancy cycling of seeds buried in soil has not been given due consideration in these models. When dormancy cycling is considered, it is shown that

seeds of both autumn-germinators and spring-germinators are in the dormant state when they are 1 yr old. Thus, unless the seeds live until at least the second germination season (i.e. usually 16-18 mo following dispersal) in effect they are part of a transient seed bank, having lived through only one germination season. We propose that for seeds to be considered part of a short-term persistent seed bank they should remain viable and germinable until at least the second germination season, and to be part of a long-term persistent seed bank until at least the sixth germination season. Our definitions are applicable to seeds with physiological, physical or morphophysiological dormancy, which often require >1 yr after maturity to come out of dormancy in nature. Modifications of the seedling emergence method are discussed to apply our definitions for detecting seeds in a soil seed bank.

- 53 FITCH, ELIZABETH A., JEFFREY L. WALCK AND SITI N. HIDAYATI. Middle Tennessee State University—Photoecology of seed germination for two rare *Paysonia* species (Brassicaceae): consequences for management in an agroecosystem.

Paysonia perforata (Rollins) O'Kane & Al-Shehbaz and *P. stonensis* (Rollins) O'Kane & Al-Shehbaz are winter annuals endemic to middle Tennessee that grow in open, frequently disturbed habitats such as agricultural fields in floodplains. Seeds of both species were collected during peak dispersal in late April/early May and given 0-16 weeks of white light at simulated summer temperatures before placement in darkness at early autumn temperatures. Seeds of *P. perforata* and *P. stonensis* required ≥ 2 and ≥ 8 weeks, respectively, of white light exposure on continuously moist substrate for $\geq 50\%$ of total germination to occur in darkness, but both needed ≥ 12 -14 weeks on alternating wet/dry substrate. In the field, the highest percentages of germination in darkness occurred for both species when seeds were placed under soybean/Johnson grass from late May to mid-July and then exposed to white light following harvesting until mid-August when they were buried. Thus, soil disturbances such as plowing occurring after late July could bury photostimulated seeds and potentially deplete the soil seed bank since seedlings would fail to emerge >2.0 cm beneath the soil surface. On the other hand, timing for fulfillment of the light requirement for germination is reduced when the substrate is continuously moist, which might correspond to the increase in precipitation predicted by one global climatic change model. Under current and future scenarios, the planting and harvesting times for corn or silage best fits the life cycle and seed photoecology of both *Paysonia* species.

- 54 MURRELL, ZACK. Appalachian State University—Phylocode and species concepts: is pattern versus process a useful construct?

The debate over species concepts has been understood as either recognition of pattern or process. The pattern of monophyletic diagnosable lineages used in the phylogenetic species concept (PSC) has been accepted by many in the systematic community. Deconstruction theory states that organizing constructs are developed through exclusion and, when applied to species concepts, we could conclude that phylogeneticists have excluded the process or niche from this construct. Therefore, deconstructionist theory tells us that the construct is repressive and that we should seek to determine the consequences of this exclusion. There appear to be at least two consequences: first, population genetics is not utilized to understand species, and second, there is no strong theoretical basis for protecting the imperiled niche along with the imperiled organism. Phylogeneticists agree that taxonomic groups are real, but that ranks are human constructs. The Phylocode codifies this concept in the principle of naming only monophyletic clades of the ancestor and all descendents. However, the Phylocode currently has not addressed the rank of species due to conflict among the founding systematists concerning the reality of this rank. Analysis of various species shows that the "least diagnosable unit" is typically at the level of the population or locality. This would

suggest that the PSC should not be recognized in a strict interpretation of the Phylocode. It would appear that the integration of population genetic analysis with phylogenetic analysis is severely hampered by this construct, and much could be gained by a fusion of the PSC with niche analysis.

- 55 WYNNS, JUSTIN, JARED KEITH AND ZACK MURRELL. Appalachian State University—Taxonomic studies in the aquatic moss genus *Platyhypnidium* M. Fleisch.

Over 200 herbarium specimens of mosses belonging to the family Brachytheciaceae were studied in order to investigate the generic affinities of five aquatic taxa: *Platyhypnidium pringlei*, *P. riparioides*, *P. muelleri*, *P. aquaticum*, and *Eurhynchium fuegianum*. A suite of morphological characters were measured and/or scored for each of the specimens, and a matrix of these data was constructed. Principal Components Analysis was performed on the morphometric data set to establish putative relationships based on morphological similarity. The highly variable internal transcribed spacer regions (ITS 1&2) of the nuclear ribosomal DNA were also sequenced for fifty specimens belonging to ten taxa. A phylogenetic analysis of the combined morphometric and molecular data sets was performed to test the monophyly of the five aquatic taxa, and to evaluate the generic status of *Platyhypnidium* by establishing its phylogenetic position relative to the terrestrial genera *Rhynchostegium* and *Eurhynchium*. Preliminary morphological data indicate that this aquatic group is monophyletic and close to *Rhynchostegium*. Results of the phylogenetic analysis will follow.

- 56 PARKS, MARGARET AND MARK FISHBEIN. Mississippi State University—Preliminary phylogeny of the Southeastern *Matelea* (Apocynaceae).

Matelea (Apocynaceae) is a genus of over one hundred species of mostly twining vines found in tropical and subtropical North and South America. In the southeast United States, eight species are found, and of these, six are in need of taxonomic revision. Within the Gonolobinae, the subtribe to which *Matelea* belongs, genera are not cleanly delimited, and morphological features defining genera are few. A phylogenetic analysis of *Matelea*, and the Gonolobinae as a whole, has never been conducted. Thus, there exists a great deal of controversy over the circumscription of these species. A phylogeny of southeastern *Matelea* was inferred from *rpoB-trnC* intergenic spacer and *rpl16* intron sequences. Taxon sampling included 25 species of *Matelea*, as well as species of *Gonolobus*, *Pherotrichus*, *Schubertia*, and *Macroscepis*. Hypotheses tested with this data set included the monophyly of southeastern *Matelea*, as well as the monophyly of *Matelea* and *Gonolobus*. Results support the monophyly of southeastern *Matelea* and *Gonolobus*. Most *Matelea* are placed in a single clade; *Pherotrichus* may belong to the same clade. In addition, the closest relatives to southeastern *Matelea* in the data set are identified.

- 57 DOFFITT, CHRIS H. AND MARK FISHBEIN. Mississippi State University—Phylogenetic relationships of the genus *Amsonia* (Apocynaceae) in North America.

Amsonia is one of the few genera in the Apocynaceae with a primarily holarctic distribution. The approximately 20 species are found in four geographic regions: southeastern and southwestern North America, the Mediterranean, and Japan. This distribution represents a disjunction pattern observed in many other taxonomic groups. The groups of species found in southeastern and southwestern North America appear to be complexes of closely related species, several of which are rare or of conservation concern. This work examines the relationships of the species within southeastern and southwestern North America and the relationship between the two regions utilizing cpDNA sequences derived from the *rpoB-trnC* spacer and the *rpl16* intron. Initial results indicate

some taxa currently recognized in the southeast are conspecific with the wide-ranging species *Amsonia tabernaemontana*. Preliminary results also provide evidence that two morphologically similar species, *Amsonia ciliata* and *Amsonia hubrichtii*, are not closely related, and that *Amsonia tabernaemontana* is not monophyletic

- 58 ESTES, DWAYNE AND RANDALL L. SMALL. The University of Tennessee, Knoxville—A preliminary analysis of the phylogenetic relationships of the monotypic genus *Amphianthus* (Scrophulariaceae s.l.) using noncoding chloroplast DNA and comparative morphology.

Amphianthus (Scrophulariaceae sensu lato, subfamily Antirrhinoideae, tribe Gratioleae) is a monotypic genus represented by the federally threatened species *A. pusillus*. *Amphianthus* is endemic to the Piedmont of Alabama, Georgia, and South Carolina where it is restricted to shallow pools on granite bedrock. The systematic placement of the genus within the Scrophulariaceae has been problematic due to its unusual morphological features including dimorphic leaves, two flower types, and capsule morphology. *Amphianthus* has been placed within the tribe Gratioleae based on its possession of distinct stigmas, posterior corolla lobe position, and glandular-punctate leaf blades. The unique morphology, however, has led some researchers to hypothesize that *Amphianthus* is an extremely old taxon (i.e. a paleoendemic) that has long evolved in isolation without extant relatives. To address the relationships of *Amphianthus* to other members of Gratioleae, chloroplast DNA sequences were generated and subjected to phylogenetic analysis. The morphology and evolutionary history of *Amphianthus* will be discussed in the context of its inferred phylogenetic relationships.

- 59 SHAW, JOEY AND RANDALL SMALL. University of Tennessee—Chloroplast DNA phylogeny and phylogeography of the North American plums (*Prunus* subgenus *Prunus* section *Prunocerasus*; Rosaceae).

Prunus sect. *Prunocerasus* (Rosaceae) is a North American taxon with 17 commonly recognized taxa that are not easily circumscribed, have overlapping morphologies, and are known to hybridize. In a previous study, we showed that the North American plums are a monophyletic group with little to no sequence divergence between species. In that study, we selected single representatives of each of the commonly accepted taxa and showed that the majority of them resolve in three primary clades. An unanticipated result of that study was that the relationships inferred among the taxa in those three clades contrast sharply with previously defined groups based on morphology. The aim of the present study was to determine if the three primary cpDNA haplotypes are confined to the taxa in which they were initially observed. Approximately 800 bp of the cpDNA *rpL16* intron were sequenced for 207 accessions of 18 taxa. The results of this study show that 14 of 18 sect. *Prunocerasus* taxa contain more than one of the three primary cpDNA haplotypes. Within most of the taxa that have more than one haplotype, there is a haplotype that is found with a greater frequency. The phylogeny generated based on the most frequent haplotype in each taxon more closely matches classical morphological assemblages than the phylogenetic hypothesis produced in our previous study. This study has broader implications for phylogenetics in general because the possibility existed in our earlier study that we could have chosen different combinations of exemplars, which could have resulted in a different phylogeny.

- 60 BECK, JOHN AND RANDALL SMALL. University of Tennessee—Preliminary investigation of *Sida* and related genera (Malvaceae) based on analysis of two chloroplast DNA regions.

The genus *Sida* (Malvaceae, tribe Malveae) is a species-rich group of global distribution. Generic circumscription of the genus has historically been problematic. However, a

number of segregate genera have been proposed to accommodate species originally placed in a large and heterogeneous *Sida* s. l. *Sida* s.s. is currently divided into eleven sections based on morphological data, and along with the segregate genera, comprise an informal group known as the *Sida* alliance. A recent phylogenetic analysis of the *Sida* alliance based on nuclear ribosomal ITS sequences recovered a group of *Sida* species (including the segregate genus *Dendrosida*) that represent the *Sida* "Core." This analysis also suggested that *Sida* is polyphyletic and a number of species currently classified in *Sida* are actually more closely related to other genera than to the Core. To complement and extend the phylogenetic analysis based on ITS sequences we have sequenced two chloroplast DNA regions (the *rpL16* intron and the 3'*trnK-matK* intron + portion of the 3' *matK* coding region) for species currently classified in *Sida* and segregate genera. The goal of the study is to assess the monophyly of the named sections of *Sida*, the relationships between *Sida* and related genera, and to provide a framework for subsequent more focused studies of individual groups of *Sida* species.

- 61 FARMER, SUSAN B. AND EDWARD E. SCHILLING University of Tennessee—Additional insights into Trilliaceae phylogeny: the Delostylis group.

An analysis was made of the evolutionary relationships of the "Delostylis Group" of *Trillium*. Although this Rafinesquian genus was never accepted, the name Delostylis can be used to define a group consisting of *Trillium catesbaei*, *T. nivale*, *T. persistens*, and *T. pusillum*; the defining feature of this group is the style which is basally fused. The status and relationships of the "Delostylis Group" of *Trillium* were evaluated based on molecular phylogenetic data (ITS, *matK* and a number of non-coding plastid regions) for the varieties of *T. pusillum* as well as for the other species in this group. In addition, their relationships to the other non-Erectum pedicellate trilliums (e.g., *T. ovatum* and *T. grandiflorum*) were examined. Preliminary results suggest that the varieties of the *T. pusillum* complex are separable using molecular data; *T. nivale* is more closely related to *T. grandiflorum* than to the rest of the Delostylis Group; and *Trillium ovatum* var. *hibbersonii* is distinct from *T. ovatum*. Based on preliminary evidence, Delostylis is not monophyletic.

- 62 LICKEY, EDGAR B., KAREN W. HUGHES AND RONALD H. PETERSEN. University of Tennessee, Knoxville—Surveying the mushroom-forming mycota of the Great Smoky Mountains National Park for the ATBI.

A three year effort to catalog the basidiomycete taxa, particularly the mushroom-forming fungi, of the Great Smoky Mountains National Park (GSMNP) was begun in the summer of 2004 as part of the ongoing All Taxa Biodiversity Inventory. The goal of this project is to collect, identify, and voucher specimens. DNA is being extracted from each specimen and the nuclear ribosomal ITS region is being amplified and sequenced. The sequences will be deposited into the sequence database GenBank. Finally, an easily accessible web-page will be created for each species, complete with description, photos, location and habitat data. Field sampling consists of weekly forays and periodic "bio-blitzes" involving experts in certain taxonomic groups. The floristic richness and geologic diversity of the GSMNP provides the ingredients for an extremely rich mycota. At present, several hundred specimens have been collected with several representing species new to science, and many representing new park records and range extensions. This presentation will emphasize those collections representing interesting occurrences.

- 63 NOBLE, SARAH MARIE AND JUAN M. LOPEZ-BAUTISTA. The University of Alabama—On going investigations on the subaerial Trentepohliales (Ulvophyceae, Chlorophyta) in the Southeastern USA.

The Trentepohliales, being neither aquatic nor terrestrial but subaerial, are a unique and understudied group of green algae which are found through out the Southeastern USA

and in many habitats of high humidity world-wide. Important aspects of their unique biology, current phylogenetic position and ecology combine to present rather interesting challenges to the researcher. This study aims toward an exhaustive monographic study of the representatives of the trentepohlialean flora in the Southeastern USA. Samples of Trentepohliales are being collected, preserved, and cultured from the Southeastern USA as a basis for a thorough morphological, cytological and molecular investigation to reveal the diversity and phylogenetic relationships of the taxa distributed in the Southeastern USA. Molecular primers for the *rbcl* gene specifically designed for the Trentepohliales, necessary because of the group's intimate association with other organisms including plants and fungi, are also being applied.

- 64 ALIYU, BALA S.^{1, 2} K. AL-ARID² AND L.J. MUSSELMAN². Bayero University, Nigeria¹, Old Dominion University²—Light microscopic study of the sporophyll anatomy of some *Isoetes* species.

Quillworts, genus *Isoetes*, resemble each other in many morphological and anatomical features such as habit, leaf shape, the arrangement of roots and sporangia position. There is however a lot of intraspecific variability. This paper presents the results of a light microscopic study of the sporophylls of three species of *Isoetes*. Sporophyll anatomy will be discussed as a taxonomic tool for establishing the basis for the delimitation of the various taxa.

- 65 EAKIN, DAVID A. Eastern Kentucky University—Syncroscopy™: Biological illustration from hand to hi tech.

Over the centuries biological illustration has evolved from simple hand drawings to an art form. Many scientists despair when confronted with the task of creating accurate, yet artful illustrations of their specimens. The challenge of accurate representation is exacerbated at higher powers of magnification due to the problems associated with depth of field. Whether drawn by hand, with the help of a *camera lucida*, or captured by cameras mounted on the microscope – most images contain only a portion of the total detail; usually using subjective decisions of the observer. The author will cover major historical methods of illustration using the moss genus *Macrohymenium* as his example. A new method of illustration will be demonstrated using current computer technologies to capture and morph serial sections.

- 66 DAWSON, LETHA, JESSICA CHIASSON AND RAJ BOOPATHY. Nicholls State University—Microbial fermentation of post-harvest agricultural residue for energy production in the form of fuel alcohol.

Sugar production is a major industry in Louisiana. In 2001, 804 producers from 23 parishes produced just over 1.2 million tons of sugar. One problem sugarcane farmers face is the post-harvest sugarcane residue in the form of leaf litter that is left after harvesting. At 3 to 10 tons residue per acre, it is a major impediment to farming practices. Currently farmers use open-air burning techniques to get rid of the residue. The open-air burning accounts for up to 21% of total air pollution in Louisiana, which is known to cause public health problems such as asthma and emphysema. Farmers are now under increasing pressure to find alternatives to open air burning. Research at Nicholls State University explores the possibilities of making alcohol from the sugarcane residue. A chemical pre-treatment process using alkaline peroxide was applied to remove lignin, which acts as physical barrier to cellulolytic enzymes. Two yeast strains including *Saccharomyces cerevisiae* ATCC strains 765 and 918 were used in the experiment. The pre-treatment process effectively removed lignin. Alcohol production in the culture sample was monitored using high performance liquid chromatography. The results indicate that

ethanol can be made from the sugarcane residue. The fermentation system needs to be optimized for evaluating the economics of producing ethanol from the sugarcane residue.

- 67 DOOLITTLE, MARK AND RAJ BOOPATHY. Nicholls State University—Use of orange oil extract and other natural products to eliminate symbiotic gut microbes of Formosan subterranean termite.

The Formosan subterranean termite, *Coptotermes formosanus* Shiraki, is an aggressive, invasive termite species that has caused billions of dollars of damage across the United States for the past 50 years. This species has been able to effectively evade modern termite control techniques. A series of tests were conducted to better understand the effects of some natural organic products on termite gut microbial endosymbionts, which are essential to the termite for the digestion of wood components and survival. The chemicals that were tested included an organic chitin-synthesis inhibitor (azadirachtin), an alkamide extracted from Cayenne peppers (capsaicin), orange oil extract, and two antimicrobial peptides (LLP1 and Analog 5). The termites were fed these chemicals at low doses, and counts of the gut microbe population sizes were observed. Statistical analyses were conducted to determine if any significant change in population size had occurred during the duration of chemical exposure. The results indicated that orange oil killed the termites very effectively within a very short period of time. The capsaicin, extracts from Asian trees, and azadirachtin each showed a significant decrease in some protozoan population sizes.

- 68 HASSAN, KOMI, QUENTON FONTENOT, MARILYN KILGEN AND RAJ BOOPATHY. Nicholls State University—Microbial removal of carbon and nitrogen from shrimp aquaculture wastewater.

The wastewater from shrimp aquaculture industry contains high concentration of nitrogen and carbon. The use of microorganisms to remove nitrogen and carbon from shrimp aquaculture wastewater was tried. We tested a sequencing batch reactor (SBR) for the treatment of shrimp wastewater. A SBR is a variation of the activated sludge biological treatment process. This process accomplishes equalization, aeration, and clarification in a timed sequence in a single reactor basin to take the place of multiple tanks in conventional treatment systems. This is achieved through sequencing stages, which includes fill, react, settle, decant, and idle. The sludge from a backwash of a single bead filter from the Waddell Mariculture Center, South Carolina, was successfully treated using a SBR. The sludge initially contained a high concentration of carbon and nitrogen. By operating the reactor sequentially, viz, aerobic, anaerobic, and aerobic modes, nitrification and denitrification were achieved as well as removal of carbon. Specifically, the initial chemical oxygen demand concentration of 1596 mg/L was reduced to 44 mg/L within 10 days of reactor operation. Ammonia in the sludge was nitrified within 3 days. The denitrification of nitrate was achieved by the anaerobic process and 99 to 100% removal of nitrate was observed. The SBR system showed promising results and could be used as a viable treatment alternative in the shrimp industry.

- 69 LOUGHMAN, KATHLEEN, ANDREW JOHNSON, LISA SMITH AND CHARLES SOMERVILLE. Marshall University—Testing a bacteria-based bioindicator of water quality above and below USACE impoundments in the Big Sandy watershed.

During August 2003, water samples from the Big Sandy watershed were collected in conjunction with the United States Army Corps of Engineers (USACE). The objective was to test a rapid and inexpensive bioindicator of water quality based on antibiotic resistant and fecal indicator bacteria. Thirty-five samples were taken along the Big Sandy mainstem and its tributaries, which include six USACE impoundments. Total cultivable bacteria were enumerated on R2A agar plus fungizone (250 ng/ml). Antibiotic resistant bacteria were

enumerated on R2A plus fungizone and ciprofloxacin (4 mg/L), erythromycin (8 mg/L), or tetracycline (12.5 mg/L). Fecal coliform, fecal streptococcus, and total coliform bacteria were enumerated by membrane filtration and cultivation on m-FC, m-E, or m-ENDO broth, respectively. Antibiotic-resistant bacteria and fecal coliform data were used to assign an overall site impact score. Individual measurements for each variable were categorized as "high", "intermediate", or "low" based on percent rank with boundaries set at the 10th and 90th percentiles. Numerical values were assigned to each category (high = 1, intermediate = 0, low = -1), and category values were summed to generate impact scores. Sites were grouped according to their assigned impact scores. Seventy-three percent of sites with positive impact scores were locations uninfluenced by impoundments. Seventy-five percent of sites with negative impact scores were locations influenced by impoundments. There is a significant difference ($P = 0.0365$) between the influenced and uninfluenced sites. Microbiological analyses suggest impoundments allow particulates and associated bacteria to settle out, leading to an apparent decrease in water impact indicators.

- 70 JOHNSON, CHRISTINA, APRIL KEENAN AND CHARLES SOMERVILLE.
Marshall University—Testing antibiotic resistance and fecal coliform as
bioindicators of water quality for the Great Kanawha River, West Virginia.

The use of fecal coliforms and antibiotic resistant bacteria as bioindicators of water quality is a novel approach not previously tested on the Kanawha River. During spring and summer 2004, twenty mid-channel subsurface water samples were collected. Total cultivable bacteria were enumerated on R2A plus fungizone (375 ng/ml; R2Af). Antibiotic resistant bacteria were enumerated using R2Af plus ciprofloxacin (4 µg/ml), erythromycin (8 µg/ml) or tetracycline (12.5 µg/ml). Fecal coliforms were enumerated by membrane filtration and cultivated on m-FC. Total cultivable bacteria and antibiotic resistance counts were statistically greater ($P < .001$) in summer samples compared to spring samples. Fecal indicator populations and antibiotic resistant populations have previously been demonstrated to be independent, but tend to be strongly correlated during high flows or run off events. Impact scores were generated by assigning population values for each sample site using a percentile rank. Population scores were summed for each sample site to generate relative impact scores. Relative impact scores for both sampling seasons are at or below zero toward the origin between river miles 95-60, reach highest levels at miles 60-40 and show a trend returning to levels similar to the upper part of the river for miles 35-0 toward the mouth. Similar seasonal patterns indicate the use of impact scores to find areas of poor water quality is independent of weather during sampling.

- 71 KEENAN, APRIL, CHRISTINA JOHNSON AND CHARLES C. SOMERVILLE.
Marshall University—Multiple antibiotic resistance patterns of microbes from the
great Kanawha River.

The Great Kanawha River is the 10th most commercially traveled river in the US and, at 99.5 miles in length, is the largest river to be wholly contained within the borders of West Virginia. The Kanawha provides water for both domestic and industrial use, and is an important recreation resource in the region. Previous studies of the Kanawha have focused on benthic macroinvertebrates and fish populations. There is little available information on microbiota, and no studies to date have addressed the presence of multiple antibiotic resistance (MAR) in Kanawha River bacteria. Subsurface water samples were collected every five miles in the main stem of the Kanawha and from five major tributaries. Total cultivable bacteria were enumerated on R2A agar plus fungizone (375 ng/ml; R2Af). Antibiotic resistant bacteria were enumerated on R2Af plus ciprofloxacin (4 µg/ml), R2Af plus erythromycin (8 µg/ml), and R2Af plus tetracycline (12.5 µg/ml). Bacterial colonies that grew on single antibiotic media were transferred to Mueller-Hinton broth supplemented with ampicillin (50 µg/ml), erythromycin (8 µg/ml), streptomycin (25µg/ml), sulfamethizole (128 µg/ml), tetracycline (12.5 µg/ml), or virginiamycin (16 µg/ml). Of the

bacterial strains isolated from R2Af plus one antibiotic ($n = 73$), 65 strains (89%) were resistant to two or more antibiotics, 36 strains (49%) were resistant to four or more antibiotics, and 14 strains (19%) were resistant to all seven tested antibiotics. These data suggest that MAR bacterial strains are common among our isolates, and that large industrial rivers may be important environmental reservoirs for antibiotic resistant bacteria.

- 72 BELVA, KASEY, SHANNON CAGLE, MATTHEW CAMPBELL, JACOB SLACK AND HENRY G. SPRATT, JR. University of Tennessee at Chattanooga—The use of a bacterial battery to produce hydrogen via electrolysis.

Previous work with bacterial batteries suggested that useful current could be generated. One mechanism to utilize the current generated in bacterial batteries could be the use of electrolysis to generate hydrogen gas. Battery cells (three replicated) were constructed using 16.3x1.2 cm disks of graphite, with the anode embedded in sediment collected from a Tennessee River riparian wetland, and the cathode in Tennessee River water above the sediments. Current generated in these cells was monitored using electronic meters connected to a data logger. Earlier studies indicated that approximately 700 μ Amp could be generated when microbes grew on organic matter originally present in the sediments. To boost current production we added glucose (1g per battery cell). Glucose addition resulted in current increases by 260 μ Amp over 24 hours. Current production was dependent on room temperature, dropping when the laboratory cooled due to cold weather. After two weekly additions of glucose the maximal current generated in one battery cell was approximately 950 μ Amp. This battery cell was connected to an electrolytic cell consisting of 1x11 cm graphite electrodes placed in dilute NaCl solution (1g/l) under submerged graduated cylinders to measure gas generated. Bubbles of H_2 and O_2 immediately became visible as the electrolysis began. Volumes of these gasses produced remained low due to dramatic reductions in battery cell temperatures and corresponding current flow due to cold weather. Further experiments under controlled temperature and light regimes are underway to determine if bacterial batteries could be used to produce usable quantities of H_2 gas.

- 73 CAGLE, SHANNON, KASEY BELVA, MATTHEW CAMPBELL, JACOB SLACK AND HENRY G. SPRATT, JR. University of Tennessee at Chattanooga—Establishment of a Bacterial battery using freshwater riparian sediments.

Microorganisms known to grow using graphite electrodes as terminal electron acceptors have been documented in numerous environments. For this study, surface sediments (top 25 cm) were collected from a wetland near the UTC Aquatic Biology laboratory on the Tennessee River. In the laboratory battery cells were set up in triplicate in aquaria by layering sediments over an anode electrode (graphite disks 16.3 x 1.2 cm), embedded in approximately 10 cm of sediment. Tennessee River water was added to a depth of 14 cm over the sediments. Cathode electrodes were placed within this water. Current flow between the electrodes was monitored using electric meters connected to a data logger. After two days equilibration initial average amperage generated by these cells was 134 μ Amp. Average current generation was low but steady for the next 70 hours, increasing to nearly 350 μ Amp. A rapid upswing in current production occurred during the next 20 hours, peaking at an average of 700 μ Amp. Following this peak, average current production was steady for the next 60 hours. Further enhancement of anoxic conditions near the anode and aerobic conditions near the cathode caused current increases of approximately 170 μ Amp over 40 hours. Changes in temperature also affected current generation. Overall, production of current with the electrodes used here, compared with smaller electrodes (surface areas of 480 vs. 96 cm^2) used in a 2002 study, was 600 μ Amp higher. Future studies addressing potential applications of these bacterial batteries are under way.

- 74 SMITH, LISA M, ANDREW N. JOHNSON, KATHY R. LOUGHMAN AND CHARLES C. SOMERVILLE. Marshall University—Using antibiotic resistant and fecal indicator bacteria to detect recurring problem areas along the Ohio River.

Bacteriological surveys were conducted every five miles on the Ohio River between Pittsburgh, PA and Rising Sun, IN during August 2001 and 2002 and between Pittsburgh, PA and Cairo, IL during August 2003 and 2004. Dilutions (10^{-2}) were plated in triplicate on R2A agar plus fungizone (250 ng/ml; R2Af) for the enumeration of total cultivable bacteria. Aliquots (0.1 ml) of each sample were plated in triplicate on R2Af plus ampicillin (50 µg/ml), ciprofloxacin (4 µg/ml), erythromycin (8 µg/ml), streptomycin (25 µg/ml), sulfamethazole (128 µg/ml), tetracycline (12.5 - 25 µg/ml), or virginiamycin (16 µg/ml) to enumerate antibiotic resistant bacteria. All plates were incubated at room temperature for one week. Fecal coliform counts were determined during 2001-2003 by filtering aliquots (15 to 50 ml) of water through 0.45 µm membrane filters. Membranes were incubated on m-FC medium at 44.5°C for 24 hours. In 2004, total coliform and *E. coli* counts were determined using the Idexx Quanti-Tray/ 2000[®] method. A population score of +1 was assigned to any count above the 90th percentile for each sample metric during the same sampling period. A population score of -1 was assigned to counts below the 10th percentile and a population score of zero was assigned to intermediate counts. Population scores were summed to achieve a site Impact Score which ranged from +5 (high impact) to -5 (low impact). Comparison of yearly impact scores suggest that the method detected recurring problem areas in the river, and identified sites that were subject to large runoff impacts.

- 75 ELLISON, MATTHEW L. AND FRANKLIN R. CHAMPLIN. Mississippi State University—Effect of permeabilization on outer membrane exclusionary properties for hydrophobic antimicrobial agents such as triclosan in *Pseudomonas aeruginosa*.

Previous work in our laboratory revealed a gram-negative bacterium known to possess an outer membrane atypically permeable to nonpolar molecules to be extremely susceptible to the hydrophobic biocide triclosan. In order to better understand how the outer cell envelope of *Pseudomonas aeruginosa* functions to exclude relatively hydrophobic molecules such as triclosan, a model system consisting of highly resistant, moderately-susceptible, and multidrug efflux pump-lacking variants was constructed. The ability of each strain to initiate growth on selective media containing hydrophobic compounds was determined in the absence and presence of chemicals known to permeabilize the gram-negative outer membrane to nonpolar molecules. A correlation was observed between resistance to triclosan and the ability to grow on media containing hydrophobic compounds. Chemical permeabilization of resistant strains resulted in sensitization to nonpolar molecules in the media. Macrobroth dilution and batch culture turbidimetric bioassays were employed to assess the ability of outer membrane permeabilizers to sensitize the cell envelope variants to two hydrophobic antibiotics and triclosan. Minimal inhibitory concentrations of hydrophobic antibiotics and triclosan decreased for otherwise resistant strains when permeabilized. Three chemically-unrelated permeabilizers sensitized all strains to low-level concentrations of triclosan in batch culture. These data support the notion that outer membrane exclusionary properties for nonpolar compounds confer intrinsic resistance to residual concentrations of triclosan in *P. aeruginosa*.

- 76 FREDERICK, L., ADRIENNE BOLDEN, A. FREDERICK AND W. LENA AUSTIN. Howard University—Effect of antifungal properties from a dark-pigmented strain of *Bacillus mojavensis* on spore germination of selected fungal species.

Preliminary studies have been conducted on the effect of sterile crude culture filtrates on the germination of spores of a selected group of fungi. Two methods, culture plate and

culture filtrate, were used in this study. In the culture plate method, potato dextrose agar (PDA) plates were inoculated with a median streak of bacteria from a 2-day-old PDA slant. Plates were incubated under ambient and controlled light and temperature conditions for 5 days. Mass spore deposits were spotted 5 mm from the margin of the streak. In the culture filtrate method, filtrates were obtained by growing bacteria in shake culture for 5 days in freshly prepared potato dextrose broth. A microscope slide technique was used to study the filtrate effect on spore germination. Spores of 7 species of fungi have been tested viz., *Aspergillus fumigatus*, *A. niger*, *Paecilomyces* sp., 2 species of *Penicillium*, *Syncephalastrum* sp., and *Trichoderma* sp. The filtrate induced complete inhibition of spore germination in *Aspergillus niger*, *Paecilomyces* sp., *Syncephalastrum* sp. and *Trichoderma* sp.; suppression of in the *Penicillium* species; and no inhibition of spore germination in *A. fumigatus*. Germination of powdery mildew conidia from leaves of *Euonymus fortunei* were tested with the culture filtrate. Preliminary results indicate that conidial germination is reduced when compared with germination in sterile broth and in water. Germination of conidia of other fungi and yeast cells associated with the collection of powdery mildew conidia were completely inhibited when compared with control spore deposits in sterile broth and water.

- 77 GRECO, TONY AND MICHAEL WINDELSPECHT. Appalachian State University—An assessment of Southern Appalachian wetlands: Developing an index methodology.

Southern Appalachian wetlands have come under increasing pressure from the increase in human activity, agriculture, and industry. Changes in land use/cover are having huge impacts on water quality in this region. This study was conducted on high elevation, riparian wetlands of the New river watershed in North Carolina. The purpose of this study is to assess and compare several disturbed and reference wetland characteristics to determine the effects of human disturbance on wetland function. Vegetative cover, water quality, water table dynamics, soils and macroinvertebrate communities were compared between two sites. Wetland vegetation was characterized using six 10m x 10m plots at each site. Water quality was assessed using both chemical analysis and macroinvertebrate surveys. Water wells were installed at each site to monitor water table dynamics, and then modeled using ArcGIS. Finally, soils were characterized and compared to determine the effect of disturbance. The data collected from these two wetlands was utilized to create an index system for Southern Appalachian wetlands. The two best predictors of wetland health were shown to be stream macroinvertebrate community and watershed land use/cover. This study has implications for quick, user-friendly assessments of high elevation wetlands and for restoration efforts.

- 78 NORTH, CHRISTOPHER A. AND ROBERT U. FISCHER. Eastern Illinois University—The effects of agricultural land-use on stream fish and invertebrate community structure.

In order to better understand the processes that occur within streams it is important that researchers attempt to incorporate some knowledge of the surrounding landscape into their studies. This is particularly true in areas like the Midwest where human alteration of the landscape, such as the conversion of natural cover types to cultivated row crops, is widespread. When assessing the health of streams, the composition and structure of the biological communities themselves tend to be the best indicators of water quality. Previous work in Hurricane Creek (Coles and Cumberland Counties, IL) has demonstrated significant differences in water chemistry and community metabolism between sites subject to differing intensities of farming in the upstream watershed. Our objective was to examine the differences in fish and invertebrate communities at four sites along the stream representing varying degrees of agricultural land-use over four sampling periods, once each season. Fish were sampled using electroseining techniques and invertebrates

were collected using the 20-jab method. Fish and invertebrate communities were compared using indices of biotic integrity (IBI, MBI) and a selection of statistical tests. This study will help researchers better understand the affects of land-use on stream ecosystems and allow land managers to make more informed decisions about rehabilitating stream ecosystems.

- 79 HANEY, DENNIS¹, WADE WORTHEN¹ AND LAURA BOYD². Furman University¹ and College of the South²—Fish, aquatic insect, and riparian vegetation communities upstream and downstream of a proposed dam site on the Tyger River, South Carolina.

Union County, SC, is considering a plan to dam the Tyger River just north of its confluence with the lower Broad River, and to develop a lake-front residential community. The proposed dam would flood approximately 5,300 acres of piedmont forest and floodplain habitat along the Tyger River and Fairforest Creek, including over 3,000 acres of public land in Sumter National Forest. The purpose of our study was to describe the existing biotic communities in this area. Riparian plant assemblages and quality assessments of riparian habitats, along with the distribution, diversity and abundance of fish and aquatic insects, were compared at sites upstream, downstream and within the proposed lake area. Measurements of water chemistry (pH, temperature, dissolved oxygen, turbidity, and major anions and cations) also were made at each site. Quality of riparian habitat was generally highest in sites that would be flooded by the proposed dam. Multivariate analysis shows that biological and chemical data cluster into three groups: Fairforest Creek sites, Tyger River sites upstream of the confluence with Fairforest Creek, and Tyger River sites downstream of the confluence. While the insect communities in the Tyger River and Fairforest Creek are similar to those seen in nearby Enoree River drainages, the fish communities in the Tyger River and Fairforest Creek are significantly more diverse than those in the lower Enoree. Also, the chemical profile in Fairforest Creek indicates possible eutrophication from an upstream wastewater treatment plant. These results suggest dam construction may have negative consequences for local biota.

- 80 KING, JOHN AND THOMAS G. JONES. Marshall University—Citizen Benthic Monitoring and how it is being used in West Virginia to compare biological conditions between an acid mine drainage site and a potential reference site in the Morris Creek Watershed.

According to the U.S. EPA, "The miles of streams and small rivers assessed for biological condition increased from 65,000 in 1995 to almost 440,000 in 2001". This dramatic increase can be contributed in part, to the rapid growth of citizen monitoring groups. My research focuses on the monitoring methods of the West Virginia Save Our Streams Program (SOS), and how citizen data is being used by the Morris Creek Watershed Association to assess the biological differences between an Acid Mine Drainage Impacted Site, and a potential reference site.

- 81 METZKE, B.A., R.U. FISCHER AND C.L. PEDERSON. Eastern Illinois University—The impacts of altered zooplankton community dynamics on electivity of juvenile fish in a cooling water reservoir.

As a cooling water supply for a coal burning power plant, Newton Lake, Jasper County, Illinois, is somewhat unique in that thermal discharge produced by the power plant along with lake morphology may create a temperature regime not generally observed in Illinois lakes and reservoirs. Specifically, surface water temperatures often exceed 35°C in the arm of the reservoir, which receives thermal effluent. Typical reservoir zooplankton communities often are characterized by a dramatic increase in cladocerans during summer months, with subsequent numerical decline through fall and into winter. We

attempted to determine whether this altered temperature regime affects zooplankton community structure, including seasonality and abundance of *Daphnia lumholtzi*, an exotic zooplankter, and whether these potential changes in zooplankton community dynamics affect electivity of juvenile fish. To answer these questions we collected zooplankton over a twelve-month period from four sites along a temperature gradient in Newton Lake. Fish were also collected from the littoral zone during the spring and early summer months. Our results indicate that population maxima for cladocerans occur in late fall and early spring while they are absent from the zooplankton during mid to late summer. As a result, peak abundance of *D. lumholtzi*, whose morphological features may create feeding difficulties for gape limited predators, coincides with emergence of larval fish creating the potential for decreased recruitment in fish populations. Ultimately, spatial and temporal alteration of zooplankton community structure in Newton Lake may be correlated with changes in feeding behavior of planktivorous juvenile fish.

- 82 EZELL, P. TAYLOR, BENJAMIN M. COALE, BRETT A. MACK AND NEIL BILLINGTON. Troy University—Lake trophic state index for southeastern Alabama water bodies.

A lake trophic state index (TSI) is a useful tool for determining the productivity of a water body. In 1997, Carlson developed a TSI based on Secchi disk depth, but also provided equations for converting chlorophyll and nutrient concentration values to TSI. This index has been used to study lakes in the Midwest and northeastern United States, but little work involving TSI has been conducted in the southeastern United States. Many small ponds in southeastern Alabama are fertilized with nutrients, especially phosphorus, to enhance fish productivity, which should expand the range of TSI values observed. We surveyed 25 water bodies in southeastern Alabama, including 23 man-made ponds and two reservoirs in order to calculate their TSI values. On-site measurements were taken for Secchi disk, total dissolved solids, turbidity, total alkalinity, hardness, and pH. In addition, vertical profiles of temperature, dissolved oxygen and conductivity were recorded. Sub-surface water samples were collected from each site during fall turnover and nutrient (total phosphorus, orthophosphate, nitrate and nitrite) and chlorophyll concentrations were determined. These values are compared with the TSI values obtained from the Secchi disk depth data from Carlson's index (zero being the best possible and 100 being the highest value, with each 10 unit increase representing a doubling in algal biomass). TSI values at our sites ranged from 48 to 93 and chlorophyll *a* concentration ranged from 7.3 to 154 $\Phi\text{g/L}$. Therefore, the water bodies surveyed in Southeastern Alabama range from oligotrophic to highly eutrophic.

- 83 SCHAUS, MAYNARD H.¹, CAREYANN WEINBERG¹, MELISSA A. VINDIGNI¹, WALT GODWIN², LARRY BATTOE² AND RANDY ROTH². ¹Virginia Wesleyan College AND ²St. John's River Water Management District—Nitrogen and phosphorus release by gizzard shad (*Dorosoma cepedianum*) and its implications for eutrophication control and restoration of Lake Apopka, Florida.

The St. John's River Water Management District is attempting to reverse the effects of eutrophication in Lake Apopka, using intensive gizzard shad removal, which removes nutrients bound in fish tissues and reduces internal nutrient recycling caused by excretion and bioturbation. In an effort to quantify the amount of nutrient release prevented by fish harvesting, we measured excretion rates of gizzard shad in June 2004. Fish were collected using gill nets and electrofishing and were placed in size appropriate containers holding prefiltered lake water. Nutrient excretion was measured as the difference between initial and final water concentrations, corrected for volume. Larger fish released significantly less N and P per gram than did smaller fish, similar to previous studies. The mean excretion rates observed in Lake Apopka were $2.02 \mu\text{mol NH}_4\text{-N g}^{-1} \text{ hr}^{-1}$ and $0.20 \mu\text{mol PO}_4\text{-P g}^{-1} \text{ hr}^{-1}$. Based on previous data of Lake Apopka shad biomass (during fish

removal), gizzard shad released approximately $0.696 \text{ mmol N m}^{-2} \text{ d}^{-1}$ and $0.0679 \text{ mmol P m}^{-2} \text{ d}^{-1}$ during the summer months. This was somewhat lower than that previously reported for Acton Lake, Ohio (30% of N loading and 45% of P loading), as would be expected following a reduction in fish biomass. Because the annual fish harvest typically removes at least 50% of the gizzard shad standing stock, it is expected that nutrient release by gizzard shad has been greatly reduced by this harvest, although that is slightly offset by a shift to smaller fish with higher mass-specific excretion rates post-harvest.

- 84 TENINI, JOHN AND DENNIS HANEY. Furman University—Increased estrogen levels associated with wastewater treatment plants in the lower Broad River watershed, South Carolina.

Prior research has documented the deleterious effects of estrogen or estrogen-like compounds on fish in river systems. Wastewater treatment plants (WWTPs) are considered a primary source of estrogenic compounds in rivers. These compounds can come from synthetic sources such as those produced from the leaching of plastics, and biotic sources such as from human urine. Previous studies have examined estrogenic contamination from very large WWTPs. In the lower Broad River watershed of South Carolina, however, there are a large number of small WWTPs in close proximity along the waterways. We hypothesized that concentrations of estrogenic compounds would increase in river water downstream of the discharge point of WWTPs and that an additive effect of WWTPs would be seen along the river. Water samples were collected upstream and downstream of ten WWTPs, and effluent samples were obtained where possible. Water samples were filtered using a C-18 filter to concentrate estrogenic compounds. A β -galactosidase assay was then performed using *Saccharomyces cerevisiae* containing the human estrogen receptor. Increased estrogen concentrations downstream of several WWTPs were found, but there was no evidence of an additive effect of multiple WWTPs. Elevated estrogen concentrations were not correlated with the size of the WWTP. However, high concentrations may occur at sites where wastewater effluent contributes significantly to river discharge. These findings merit closer inspection of these sites.

- 85 NOVOVESKA, LUCIE¹, SCOTT W. PHIPPS² AND CHARLES L. PEDERSON¹. Eastern Illinois University¹, Weeks Bay National Estuarine Research Reserve² — Benthic algal community structure and bioaccumulation of mercury in a coastal watershed.

Largemouth bass in the Fish River watershed of coastal Alabama are known to contain relatively high concentrations of mercury. Monitoring efforts often include description of biotic community structures as well as bioconcentrations of pollutants such as mercury at impacted and reference sites. Benthic microalgal assemblages may be an ideal choice for biological monitoring of anthropogenic stress in stream ecosystems, largely due to their sedentary nature and their ability to bioaccumulate toxic substances. Artificial substrates were deployed at 13 sites in the channel of the Fish River and selected tributaries at different distances from Weeks Bay, a subestuary of Mobile Bay. Principal Components Analysis indicates that 11 sites are homogeneous on a physical and chemical basis, while two sites are somewhat more distinct. This environmental variability is reflected in the diatom assemblages which were found to characterize each site. However, *Gomphonema parvulum* is cosmopolitan throughout the watershed and therefore is suitable for assessment of mercury contamination. Individual cells of *G. parvulum* from each site were observed using a Scanning Electron Microscope equipped with an Energy Dispersive X-ray Spectrometer (SEM-EDS) in effort to detect the presence of mercury. Failure to detect mercury via SEM-EDS suggests that the method is insensitive to presence of the element, that *G. parvulum* does not bioconcentrate mercury, or that aqueous concentrations of mercury within the Fish River watershed are negligible.

- 86 GRAETER, GABRIELLE J. Savannah River Ecology Laboratory—Habitat selection and movement patterns of southern leopard frogs (*Rana sphenoccephala*) in response to altered forest habitats.

Through development, urbanization and conversion of land to agricultural use, humans are having widespread and increasing impacts on the landscape in most regions of the world. These land-use changes result in habitat loss and fragmentation, which threaten biological diversity and long-term population viability of many organisms. Because amphibians have complex biphasic life cycles and are often sensitive to habitat alteration and pollution, they are considered to be excellent biological indicators of environmental integrity. As part of a larger experiment, the upland habitats surrounding two ephemeral wetlands in the Upper Coastal Plain of South Carolina were subjected to four forest management regimes (clearcut, clearcut with debris removed, thinned, control). To examine behavioral responses of southern leopard frogs (*Rana sphenoccephala*) to these altered habitats, I released frogs along the edges between forest treatments and tracked them using fluorescent powder. I analyzed the data for each frog's initial treatment choice and microhabitat selection, and used Geographic Information Systems (GIS) to evaluate movement patterns. My results demonstrate the potential effects of forest management practices on amphibian dispersal and migration. This research was partially supported by National Science Foundation Award DEB-0242874 and by the Environmental Remediation Sciences Division of the Office of Biological and Environmental Research, U.S. Department of Energy through the Financial Assistance Award no. DE-FC09-96SR18546 to the University of Georgia Research Foundation.

- 87 RICHTER, STEPHEN C. Eastern Kentucky University—Effects of habitat fragmentation on population persistence of rare gopher frogs.

Anthropogenic habitat fragmentation and reduction are major causes of population declines and extinction. As these processes intensify, our ability to rescue imperiled taxa is dependent on an understanding of historical, demographic, and genetic parameters of shrinking populations. I studied the demography and population genetics of an isolated population of Dusky Gopher Frogs, *Rana sevosa* from 1996–2004. Microsatellite DNA markers and mark-recapture data were used to address three research objectives: (1) to compare genetic variation in the isolated population of *R. sevosa* to non-isolated populations of other gopher frogs, *R. capito*; (2) to determine temporal change versus stasis (over a ten-year period) in population polymorphism of *R. sevosa*, and (3) to evaluate population persistence using ecological, historical, and genetic data. *Rana sevosa* had significantly lower genetic variation than non-isolated populations of its sister species. In fact, the isolated population had an observed heterozygosity that was 72% and allelic richness that was 61% of the non-isolated population. Seven alleles were lost from the *R. sevosa* population during 1997–2004. No differences were found for heterozygosity over this period, but significant population structuring among years corroborated demographic data of high annual population turnover and small population size. Additionally, it appears that a historic bottleneck (pre 1997) and a more recent bottleneck (between 1997 and 2001) occurred based on genetic signatures. For *R. capito* and *R. sevosa*, small population size appears typical and sufficient to maintain historically interconnected populations, but habitat fragmentation has led to severe, range-wide declines of both species.

- 88 GIBBONS, MEGAN. Birmingham-Southern College and Washington University in St. Louis—Predator diversity and the evolutionary effect on behavior and survival in tadpoles of gray treefrogs (*Hyla versicolor*).

The evolutionary history of populations may have a significant influence on the types of behaviors exhibited by individuals. For example, a prey species consisting of populations

that occupy several habitat types may exhibit various degrees of antipredator behavior, according to the types and numbers of predators that exist in those habitats. I conducted a study to compare antipredator behavior and survival of gray treefrog (*Hyla versicolor*) tadpoles from ponds with and without fish predators. I assumed that gray treefrogs exhibited philopatric breeding at these sites, and that fishless ponds had been without fish for at least 20 generations. I predicted that tadpoles from ponds with fish would exhibit higher refuge use and less activity in the presence of predator cues (green sunfish, *Lepomis cyanellus*) than tadpoles from fishless ponds. In addition, I predicted that tadpoles from ponds with fish would have higher survival rates when exposed to predators than tadpoles from ponds without fish, due to more effective antipredator behavior. Results were not consistent with my prediction; surprisingly, in the survival experiment, tadpoles from ponds with fish suffered significantly more predation (88%) than tadpoles from ponds without fish (71%). These results may indicate that green sunfish from ponds with tadpoles have adapted to the particular behavior patterns of the tadpole populations with which they coexist, and are less effective predators on tadpoles that exhibit different behavior patterns.

- 89 SIAS, JAIME AND THOMAS K. PAULEY. Marshall University—Water pH tolerance levels for *Hemidactylium scutatum* and *Rana sylvatica* at high elevation fens in West Virginia.

For two years, water pH tolerance levels of two amphibian species were studied at four high elevation fens in West Virginia. At one fen, Yellow Creek, hundreds of *Rana sylvatica* migrated and deposited eggs, but not one egg successfully transformed during these two years. Field data taken bimonthly from April through October showed Yellow Creek's average water pH to be 4.05 which was significantly lower than the three other fens. Historical records demonstrated that the average water pH had decreased at Yellow Creek for over fifty years. This fen had many breeding sites but successful reproduction was shown to occur in only one species, *Hemidactylium scutatum*. This represents a decline in pH that many amphibians may not be able to tolerate. Sixty *Rana sylvatica* and fifty *Hemidactylium scutatum* embryos plus 36 *H. scutatum* larvae and 30 larvae from eggs taken from the field and hatched in the laboratory, were quantified using a median tolerance limit test (96-hour Ti^m). Median tolerance limits of these two amphibians showed that the eggs and larvae of *H. scutatum* were more acid tolerant. Median tolerance limits of eggs and larvae of *H. scutatum* and *R. sylvatica* showed that *H. scutatum* embryos are more tolerant of acidic conditions and so are better able to survive in these acidic conditions.

- 90 PRICE, STEVEN J.¹, MICHAEL E. DORCAS¹, ALISA L. GALLANT², ROBERT W. KLAVER² AND JOHN D. WILLSON³. Davidson College¹, USGS/EROS Data Center, Sioux Falls, SD², Savannah River Ecology Laboratory³—Impact of land cover change on stream salamander populations in the Piedmont of the eastern United States.

Most scientists consider habitat loss and degradation to be the major threat to amphibian populations. Studies of land cover changes from 1972 to 2000 in the Piedmont of the eastern United States show a significant increase in the amount of urban land cover and a corresponding reduction in the amount of forested habitat. Small streams in the Piedmont support high densities of salamanders and are often the first aquatic habitats to be affected by landscape-altering factors such as urbanization and pollution. Landscape changes in the Piedmont have likely resulted in a significant decrease in stream salamander abundance, but the magnitude of this change is unknown. The objective of this study was to estimate the change in abundance of stream salamanders in small watersheds in the Piedmont region of the eastern United States over the last 3 decades. We used US Geological Survey (USGS) Land Use/Land Cover trend data to quantify land

cover changes within small headwater stream watersheds in the Piedmont. Changes in salamander abundance were estimated using models which allow predictions of the relative abundances of salamanders based on land cover within each watershed. Results of this study will help scientists and policy makers understand the significance of habitat alteration on amphibian populations. This project was supported by Duke Energy, the National Science Foundation, and the USGS Amphibian Research and Monitoring Initiative.

- 91 BAUMAN, MICHAEL L.¹ AND LAWRENCE A. WILSON². Emory University¹ and Fernbank Science Center²—The population status and limiting factors of the eastern hellbender (*Cryptobranchus alleganiensis*) in the Tennessee River Drainage of Georgia.

In light of the drastic global amphibian declines of last twenty there is a decisive need for accurate and current information concerning the location and threats to rare amphibians such as the eastern hellbender. I approach this concern through with three methodologies. The first is a 200-meter presence/absence survey of creeks and rivers within the designated study area. Following the positive results of this first method, I employ is a 400-meter survey to determine species density using this to measure relative population health between populations. In coordination with the first two methods, the third examines overall stream features at each water area surveyed in addition to specific details measured at the location of each individual found. Our research shows a marked decline in the range of Georgia *Cryptobranchus* populations compared to published locality data. Initial findings suggest the decline is correlated with changes in turbidity and dissolved oxygen. Some of these changes appear to be the consequence of land use changes while the source for other declines and absences are still uncertain. Results are spatially analyzed with ArcGIS to identify grades of population and habitat health across the Georgia range in order to create an up-to-date conservation plan for hellbenders and their habitats in Georgia. Financial and equipment acknowledgements go to the Scholarly Inquiry and Research at Emory Grant, the Emory University Environmental Studies Department, and Fernbank Science Center.

- 92 MILLER, BRIAN T. AND MATTHEW L. NIEMILLER. Middle Tennessee State University—Survey for and relative abundance of the Tennessee cave salamander complex, *Gyrinophilus palleucus* and *G. gulolineatus*, in Tennessee.

The Tennessee Cave Salamander complex consists of two recognized species. *Gyrinophilus gulolineatus* is associated with stream-caves in the Tennessee River drainage and the Ridge and Valley physiographic province of east Tennessee. Several subspecies of *Gyrinophilus palleucus* are recognized: *G. p. palleucus*, associated with the Crow Creek drainage on the Eastern Escarpment of the Cumberland Plateau, *G. p. necturoides*, known from one cave on the Western Escarpment of the Cumberland Plateau, and an unnamed form in several caves in the Central Basin. The taxonomic affiliations of populations recently reported from the Eastern Highland Rim are unknown. We surveyed caves from spring through fall of 2004 to determine if populations were extant and to determine the relative abundance of individuals in these populations. Also, we searched caves that we thought might harbor populations that had gone undetected during previous surveys. We observed more than 200 individuals in 12 caves. Historic populations were extant within the Central Basin (2 caves), on the eastern escarpment (2 caves), on the western escarpment (1 cave), and in the Ridge and Valley of eastern Tennessee (2 caves). The numbers of individuals encountered at each of these caves was equal to or greater than that reported from previous surveys. Additionally, we located new populations on the Eastern Highland Rim (Warren County, 2 caves) and Western Escarpment (one cave in Grundy County and two in Coffee County). Based on our

preliminary data, populations of the *G. pallescens* complex in Tennessee are stable. (Supported by TWRA grant 04-121 to BTM).

- 93 FELIX, ZACHARY¹, YONG WANG¹ AND CALLIE SCHWEITZER². Alabama A&M University¹, and USDA Forest Service, Southern Research Station²—The effect of changing canopy cover on amphibian oviposition rates.

Understanding the mechanisms that are responsible for changes in amphibian populations due to forest management will lead to a greater predictive ability for amphibian-friendly managers. We were interested in how changes in canopy cover affected choice of amphibian oviposition site in the context of silvicultural treatments. To test for variation in oviposition rates of amphibians we used small artificial pools on experimental shelterwood cuts with varying levels of overstory tree retention. Treatments included a spectrum of retention levels in 25% increments including clearcuts (0% retention), 25%, 50%, 75% retention and controls. Pools were surveyed every 7-10 days between March and November 2004 and egg masses were identified and tallied. Monthly readings of water temperature, dissolved oxygen and pH yielded information about biophysical conditions in pools. Four species of amphibians laid eggs in pools, including mountain chorus frogs (*Pseudacris brachyphona*) which showed a positive relationship between egg mass number and tree retention. Egg mass number of Cope's gray treefrogs (*Hyla chrysoscelis*), on the other hand, was negatively correlated with tree retention. American toads (*Bufo americanus*) egg masses were most abundant on intermediate cuts, and spotted salamanders (*Ambystoma maculatum*) only laid eggs in closed canopy pools. Water temperature, dissolved oxygen and pH showed a trend from high values in clearcuts to lows in controls. We feel it is likely that changes in forest canopy cover associated with silviculture and their effect on conditions in larval habitat help to shape forest amphibian communities by altering population dynamics.

- 94 WYCKOFF, GEORGE R., MATT NIEMILLER, BRAD GLORIOSO AND BRIAN MILLER. Middle Tennessee State University—Community structure of a complex wetland: chronology of breeding migrations of five ambystomatid salamanders.

Arnold Air Force Base is a highly diverse area of the Barrens region of Tennessee and is home to many threatened and endangered plants and animals. Surveys of the base's herpetofauna have identified a diverse community of reptiles and amphibians. Drift-fence / pitfall arrays along with minnow traps were placed in and around an entire wetland at Arnold Air Force Base, TN. Five species of ambystomatids were found utilizing the wetland as a breeding habitat along with 14 other amphibian and 9 reptile species. *Ambystoma opacum* entered the wetland first in mid September (Sep 17th thru Oct 5th) and emigrated out in the first week of November (Nov 5th) with metamorphosed individuals leaving the wetland in mid May (May 15th). *Ambystoma talpoideum* immigrated to the wetland in mid January (Jan 9th thru Jan 29th) and emigrated in mid April (Apr 13th thru Apr 26th). *Ambystoma maculatum* immigrated to the wetland in late January (Jan 30th – Feb 12th) and emigrated at the first of March (Mar 2nd and 3rd). *Ambystoma tigrinum* immigrated to the breeding site in early February (Feb 4th thru 14th) and emigrated in mid March (Mar 16th), with metamorphosed individuals leaving the site on July 14. *Ambystoma texanum* immigrated to the breeding site in early February (Feb 6th thru 14th) and emigrated in early March (Mar 2nd and 3rd). The presence of five ambystomatid salamanders breeding in one site is rare and sets up a highly competitive community.

- 95 NIEMILLER, MATTHEW L. AND BRIAN T. MILLER. Middle Tennessee State University—Demography of the Tennessee cave salamander complex (*Gyrinophilus pallescens* and *Gyrinophilus gulolineatus*) in Tennessee.

As part of an ongoing project to determine population status and relative abundance of the Tennessee Cave Salamander complex (*Gyrinophilus palleucus* sp. and *G. gulolineatus*) in Tennessee, historic and potential localities were surveyed from June through October 2004. 204 salamanders were observed in 12 caves in Coffee, Franklin, Grundy, Knox, Rutherford, and Warren County. In most caves, four or fewer salamanders were observed. However, 19 or more individuals were found in five caves with counts of 19, 24, 28, 41, and 48. Of the salamanders observed, 131 were captured, yielding a 64% capture rate. Each captured salamander was measured and weighed, and we injected a small (1 mm x 2 mm) visible implant alphanumeric tag (VI Alpha from Northwest Marine Technology) into the base of the tail of some individuals (n = 98) to determine population sizes. To date, only three individuals have been recaptured. The age structure of populations of the Tennessee Cave Salamander complex in Tennessee was compared based on 5 mm snout-vent length increments. Adults (greater than 70 mm SVL) dominated each of the populations, but larvae and juveniles were found at each cave, indicating that reproduction was occurring. (Supported by TWRA grant 04-121 to BTM).

- 96 COLEMAN, ANDREW¹, ROBERT WAYNE VAN DEVENDER¹, MARY U. CONNELL¹ AND PAUL CHIPPINDALE². Appalachian State University¹ and University of Texas, Arlington²—Systematic relationship between *Plethodon longicrus* and *Plethodon yonahlossee*.

Since the 1970's, *Plethodon longicrus* has been considered a geographical variant of *Plethodon yonahlossee*. Numerous studies, utilizing both morphological and electrophoretic analyses, have produced contradicting results when examining this systematic question. The present study includes a morphological analysis that incorporated principal component analysis, a technique not used previously, and discriminant function analysis to evaluate measurements taken for twenty-one characters. Each character was regressed upon snout-vent length to accommodate allometric growth, and the residuals from those regressions were used in the principal component analysis. A significant north (*P. yonahlossee*) vs. south (*P. longicrus*) difference was found on the first principal component regardless of whether sexes were analyzed together or separately. Since members of the Genus *Plethodon* are morphologically conservative, these results suggest that two distinct species are present. The results from the discriminant function analysis will be reported. A genetic analysis was also conducted using an 800 base pair fragment of the mitochondrial gene for cytochrome B. Fragments were cloned and sequenced using M13 forward and reverse primers. Relationships among populations were analyzed using PAUP (version 4.0). Because this analysis included new populations from the geographical gap between the two putative forms, genetic relatedness between all the populations should elucidate the number of species level groups involved in this complex. The genetic analysis will be reported and compared with the morphological results.

- 97 WENTWORTH, THOMAS AND KRISTEN ROSENFELD. North Carolina State University—Responsible conduct of field research.

Ethical issues related to the responsible conduct of research (e.g., proper acknowledgment and citation of the work of others, proper authorship practices, and inappropriate activities, such as data falsification or fabrication) have received considerable attention by funding agencies, scientific societies, industry, and the academy. However, ethical issues unique to field research have received inadequate treatment both in the literature and in public discourse. Issues such as the effects on biological populations of collection of vouchers or research subjects, risks associated with research on rare, threatened, or endangered species, and the effects on natural systems of manipulative and experimental studies, are but a few examples of the complex issues with ethical dimensions that are encountered by most field biologists. Our objective is to

provide researchers with a catalogue of ethical issues frequently encountered in field research, and to provide guidance in resolution of these issues. We present the case for the importance of ethical conduct of field research, along with guidelines for navigating complex ethical challenges. We illustrate the latter with analyses of real and contrived case histories. We propose that all students and researchers in the natural sciences should receive training about the ethical issues surrounding field research and that codes of ethical conduct should be expanded to include the issues we address.

- 98 GAGE, KARLA, MELISSA LEE AND MACIEJ BIERNACKI. University of Memphis—Plant response to resource gradients.

Edge environments create unique habitats with a diverse range of microclimates. Species diversity may be different in these environments than in the surrounding landscape. In a novel approach I will analyze the spatial relationships among soil moisture, light, and temperature in edge zone. I expect that these factors have major effects on plant community composition of edge zones. Soil moisture, light, and temperature oscillate in diurnal and seasonal cycles. A gradient of resource availability will be created where one habitat type blends into another. Plants will be examined throughout the study areas and used as phenological indicators of environmental conditions. For the study species, I will observe plant morphology and time of completion of phenological stages ranging from seed germination to flower production. The information will be used to create spatial and temporal databases on plant performance, moisture, light, and temperature for each plot. Data will be analyzed for patterns. The general goal of my research is to develop a quantitative model of edge zone and its effects on plants.

- 99 HANCOCK, THOMAS E. AND WILLIAM K. SMITH. Wake Forest University—Water availability is not a limiting factor for photosynthesis in two east coast (USA) beach plants, *Amaranthus pumilus* and *Cakile edentula*.

Water availability has traditionally been listed as one of many factors that limit growth and determine beach plant distribution patterns. Few beach studies, however, have attempted to detail the relationship between water availability and photosynthesis as measured by an infrared gas analyzer (IRGA). A study was initiated on the southeastern end of Topsail Island, NC (USA) to determine if water availability limits photosynthesis (as measured by an IRGA) of *Amaranthus pumilus* and *Cakile edentula*. Average soil water content was remarkably consistent (2.8 – 4.5 %) across a variety of weather conditions. Total yearly rainfall as measured by micrometeorological instruments on site was 139 cm, with 37% of the total occurring in the summer months and the remainder evenly distributed in winter, spring and fall. *Amaranthus pumilus* had higher xylem water potentials (-0.2 to -0.8 MPa) than *Cakile edentula* (-0.3 to -1.3 MPa) throughout representative days, although both species experienced gradual declines in water potential from dawn until early afternoon when rainstorms recharged the water supply. *Amaranthus pumilus* had higher maximum photosynthetic rates ($26 \mu\text{mol m}^{-2} \text{s}^{-1}$) than *Cakile edentula* ($18 \mu\text{mol m}^{-2} \text{s}^{-1}$), and photosynthesis typically decreased in early afternoon, but then rebounded following rainstorms. It appears that water availability is sufficient for *Amaranthus pumilus* and *Cakile edentula* to maintain high rates of photosynthesis throughout the early hours of a given day and that afternoon rains commonly recharge the water supply, enabling both species to sustain high photosynthesis well into late afternoon.

- 100 KNEBEL, LARISSA, DANIEL J. ROBISON AND THOMAS R. WENTWORTH. North Carolina State University—Resin flow responses to fertilization, wounding, and fungal inoculation in loblolly pine (*Pinus taeda*) in North Carolina.

Southern pine beetle (*Dendroctonus frontalis*) infestations are a major consideration in the management of loblolly pine (*Pinus taeda*) plantations in the southeastern United States.

Because resin flow in pines is the primary means of natural defense against southern pine beetle, factors affecting resin flow are of great importance. We examined the influence of fertilization, wounding, and fungal inoculation on resin flow in 6- and 12-year old stands of loblolly pine and determined the extent of that influence within and above the wounded area and through time. Fertilization increased constitutive resin flow, but only the younger trees were able to sustain increased resin flow after wounding and inoculation treatments. An induced resin flow response occurred between one and thirty days after inoculation treatments. Inoculation resulted in greater resin flow than wounding alone, but increasing amounts of inoculum did not result in increasing resin flow. Increased resin flow (relative to controls) lasted at least 90 days after wounding with inoculation treatments. This increase appears to be limited to the area of treatment. The lasting effects of fungal inoculation on resin flow in loblolly pines, as well as the response to fertilization, suggest that acquired resistance could aid in decreasing susceptibility of loblolly pine to southern pine beetle.

- 101 GIBSON, PHIL¹, STANLEY RICE² AND CLARE STUCKE¹. Agnes Scott College¹ and Southeastern Oklahoma State University²—Levels and structuring of population genetic variation in a rare tree species *Alnus maritima* (seaside alder).

Seaside alder is a rare tree species that occurs in highly disjunct populations in the Delmarva Peninsula, south-central Oklahoma, and northeastern Georgia. The levels and structuring of allozyme variation was measured within and compared among populations in these three areas. Analyses indicated characteristically low levels of genetic variation for the entire species and individual populations, significant genetic differentiation among populations, and a significant heterozygote deficiency in all populations despite a predominantly outcrossed mating system. Furthermore, although mating events do produce viable seeds, there is no evidence of individuals being recruited to any of the populations through sexual reproduction. The results of these studies will be of value in developing effective conservation strategies for this potentially endangered species.

- 102 REILLY, CHRISTHOPHER D.¹, M. CATHERINE BRODERICK¹, KATHLEEN M. SEESE¹, DAVID GLICK¹, SUSAN JONES-HELD¹ AND MICHAEL E. HELD^{2*}. King's College¹ and Saint Peter's College²—Microbial communities on leaf surfaces and their relation to pathogenesis in American beech (*Fagus grandifolia*).

Forest communities in the Eastern United States where American Beech (*Fagus grandifolia*) is a major component have been severely affected by the fungal pathogen, *Nectria coccinea* var. *faginata*, the causative agent of Beech Bark Disease. We were interested in characterizing the leaf microbial communities on American Beech trees exhibiting various degrees of the disease. Our goal was to determine if late stage infected trees became more susceptible to other pathogens, primarily bacterial in origin. We used Ecolog™ to examine the microbial diversity on the leaf samples collected from trees that exhibited all stages of the disease. Individual bacterial identifications were determined using fatty acid profile analysis via gas chromatography. Our preliminary analysis indicated a more diverse microbial fauna on late stage diseased trees. Many of these identified bacteria were plant pathogens. Our initial findings indicate that American Beech trees infected with Beech Bark Disease may be more susceptible to other bacterial pathogens. Also, we observed that occurrence of greater numbers of pathogens in the severely affected American Beech trees correlated with elevated levels of ascorbate. Ascorbate has been implicated in the plant responses to pathogen invasion.

- 103 SOUZA, LARA¹, JENNIFER M. NAGEL¹, E. CAYENNE ENGEL¹, JAKE F. WELTZIN¹ AND RICH J. NORBY². University of Tennessee¹ Oak Ridge National Lab²—Can daily carbon gain of four old-field species explain their performance in a community under global climate change?

Increasing concentrations of carbon dioxide [CO₂] coupled with increases in global temperatures and changes in precipitation events are likely to impact plant community structure and physiological processes, such as the exchange of carbon and water. Studies in the past have mainly focused on one or two climatic factors, particularly on the responses of vegetation to CO₂. To improve our understanding of global climate change on biological systems, we investigated the interactive effects of CO₂, temperature, and soil water availability on a constructed old-field ecosystem, including C₃, C₄, and nitrogen-fixing plant functional types near Oak Ridge, Tennessee. Leaf-level gas exchange measurements were performed inside 4-m diameter open-top chambers. We estimated leaf-level daily carbon gain of two community dominant species (*Trifolium pratense* and *Dactylis glomerata*), as well as two community subordinate species (*Plantago lanceolata* and *Solidago canadensis*) every six weeks during the growing season. Preliminary data suggests that all species had greater daily carbon gain under elevated CO₂, but structural components (SLA) were affected by temperature and water mainly. Overall, community dominant species did not necessarily exhibit greater daily carbon gain than subordinate species.

- 104 KINCAID, JOSHUA A. University of Georgia—The status of *Tsuga canadensis* L. (Carr.) (eastern hemlock) regeneration in southern Appalachian upland forests.

With impending climate changes and alterations of hemlock-hardwood forests in the southern United States by the non-native hemlock woolly adelgid, it is important that we obtain baseline data in order to monitor future changes in these forest ecosystems. Research from several northern locations has shown that many infested forests experience 50-100% hemlock mortality. Moreover, there has been no research which specifically examines the status of eastern hemlock regeneration in the southern Appalachian Mountains. To assess eastern hemlock regeneration in the southern Appalachian Mountains, I established fifty 14x21 meter plots within mature hemlock-hardwood stands of the Great Smoky Mountains National Park. I used variance-to-mean ratios and geographically weighted regression to examine local and landscape-scale patterns of eastern hemlock regeneration. Variance-to-mean ratios indicate significant within-plot (local) clumping of regeneration, which is usually attributed to hemlock's affinity for particular substrates (e.g. decaying wood). I attribute the clumping of regeneration in Great Smoky Mountains National Park to canopy gaps, which promote both prolific hemlock regeneration and rosebay rhododendron expansion. Geographically weighted regression results suggest a gradient from sites with high seedling densities and high rhododendron cover to sites with high sapling densities and low rhododendron cover. Land managers may need to control rhododendron expansion so seedlings that become established are recruited into the larger size-classes, thus perpetuating hemlock in upland forests. The geographically weighted regression models also show significant spatial variation in model estimates, indicative of potential landscape-scale contextual influences (topographic conditions, vegetation associates, and historic land-uses) on the regeneration of the eastern hemlock.

- 105 WELTZIN, JAKE F., GREGORY M. CRUTSINGER, MATTHEW C. FITZPATRICK, MARTIN A. NUÑEZ, CHRISTOPHER M. OSWALT, JILL M. STEPHENS, PHILIP B. ALLEN AND NATHAN J. SANDERS. University of Tennessee—Combined and relative effects of resource availability, propagule pressure, and insect herbivores on invasion in an old-field system.

Invasive species threaten the diversity and function of natural ecosystems. It is thus important to better understand factors that control invasions in natural ecological systems. Our goal was to determine how biotic and abiotic factors might affect establishment of the invasive plant *Lespedeza cuneata* in an old-field in eastern Tennessee. We initiated a three-factor experiment with two levels of propagule pressure (1,730 seeds added per m², control), three levels of nitrogen availability (10 g nitrogen/m²/year addition, 1000 g carbon/m²/year added as sucrose to reduce soil nitrogen, control), and two levels of insect herbivory (reduced through application of insecticide, control). Establishment of seedlings of *L. cuneata* was controlled by complex interactions among our three experimental variables: In plots that received insecticide, the addition of propagules increased substantially the density of *L. cuneata* in the carbon-added and control nutrient treatments, but not in the N-added treatment. However, in plots where insects were present, propagule and nutrient treatments did not affect establishment of *L. cuneata*. In all plots, addition of N decreased light available below the soil canopy and decreased soil moisture contents; a complementary greenhouse experiment suggested that light was a more important constraint on *L. cuneata* establishment than was soil moisture. We conclude that invasions by *L. cuneata* may be propagule-limited, and that manipulations of soil N status alone are insufficient to control *L. cuneata* invasion.

- 106 FISHBEIN, MARK¹, ROBERT A. RAGUSO² AND TRACEY A. SLOTTA³. Mississippi State University¹, University of South Carolina², USDA-ARS³—Characterization of the floral scents of *Asclepias exaltata*, *A. syriaca*, and their hybrid in a naturally occurring hybrid zone.

Recent advances in the development of transgenic crops have heightened awareness of potential ecological impacts. One area of concern is the risk of gene flow from genetically modified crops to unintended target plants. Basic research in the ecology of hybridization may have important insights to offer by accurately measuring the contribution of individual plant traits to reproductive success. However, one important trait to pollinator attraction, floral scent, has been largely unstudied from this perspective. As a first step in understanding the role of floral scents in promoting or inhibiting interspecific gene flow, we characterized scent compounds of naturally occurring hybrids of *Asclepias*, our model system for investigating these phenomena. We used dynamic headspace scent collection from inflorescences of *A. syriaca*, *A. exaltata*, and putative hybrids in Shenandoah National Park, Virginia. Scents were sampled from at least five individuals of each species and putative hybrids. Scents were characterized by gas chromatography-mass spectrometry. Within-species scent profiles were highly repeatable. The parental species differed greatly in scent composition. The scent of *A. syriaca* was highly concentrated and composed of many, diverse compounds, whereas that of *A. exaltata* was extremely weak and much less diverse. The scents of hybrids were similar in strength and composition to *A. syriaca*, however, two compounds found at barely detectable levels in that parent were expressed at highly elevated levels in hybrids and formed major components of the scent. This may be the first documented case of transgressive expression of scent compounds in hybrids.

- 107 AL-ZEIN, MOHAMMAD S¹, KHOUZAMA M KNIO² AND LYTTON J. MUSSELMAN. Old Dominion University¹, American University of Beirut²—A preliminary study of the floral biology of *Michauxia campanuloides* L'Hér. (Campanulaceae).

Named after André Michaux, French botanist and author of the first flora of North America, the genus *Michauxia* L'Héritier (Campanulaceae) has seven described species native to the Eastern Mediterranean, Turkey, Armenia and Iran. Very little is known about the biology and ecology of *Michauxia*, despite the fact that at least three species have been used as garden plants. To understand the floral biology of *Michauxia campanuloides*, the

phenology, pollen presentation, as well as the insect visitors were studied in Lebanon. The plant is dichogamous, with temporally separated staminate and pistillate phases. Potential pollinators for this plant as well as two insect visitors shared with *Campanula* have been identified.

- 108 ALARID, KHALID M, REBECCA D. BRAY AND LYTTON J. MUSSELMAN. Old Dominion University—Microspore wall morphogenesis of Isoetes (Isoetaceae).

Microspore wall morphogenesis of 4 species of Isoetes has been studied using scanning and transmission electron microscopy. The microspores are monolete and 20-40µ in diameter. Each species shows a unique ornamentation. The microspore wall consists of four layers: perispore, paraexospore, exospore and endospore. Immediately after meiosis, the paraexospore is formed around the microspore. The exospore is formed next between the cell membrane and the paraexospore. Finally, the perispore is deposited on the paraexospore and the endospore is formed within the exospore. Paraexospore, exospore and endospore are derived from the cytoplasm of the microspore. The sporopollenin materials of the perispore are derived from the cytoplasm of the sporangial tapetum.

- 109 ALIYU, BALA S.^{1, 2}, A.M. EMECHEBE³ AND B.B. SINGH³. Bayero University, Nigeria¹, Old Dominion University², and International Institute of Tropical Agriculture (IITA), Nigeria³—The cultural control of *Striga hermonthica* on pearl millet (*Pennisetum glaucum*) through inter-row and intra-row intercropping with cowpea (*Vigna unguiculata*).

In a field trial conducted in the 2001/2002 cropping season at the International Institute of Tropical Agriculture (IITA) research farm in Minjibir, Kano State, Nigeria, two cowpea (*Vigna unguiculata*) varieties were selected in vitro using the "IITA cut-root method" for their ability to induce suicidal germination in *Striga hermonthica*. The two cowpea varieties were intercropped with millet in different planting patterns and densities as a cultural control mechanism for the most economically important parasite of cereal crops in Africa, *S. hermonthica*. Intra-row intercropping of millet and cowpea at high cowpea density produced the least number of *Striga* plants per host and per plot, and subsequently the highest millet crop yields. Least yield was not recorded in the sole millet plots, which had the highest *Striga* infestation. Intercropping millet with cowpea varieties appears to have a negative effect on *Striga* plant and increases the productivity of the host crop. Further research is recommended to identify appropriate legume varieties, planting density, intra-row and inter-row cereal-legume mixture for the control of *S. hermonthica* compatible with local practice of resource-poor African farmers who had hitherto rejected other control methods due to socio-economic reasons.

- 110 TENNAKON, KUSHAN U.^{1,2}, JAY F. BOLIN¹ AND LYTTON J. MUSSELMAN¹, Department of Biological Sciences, Old Dominion University¹ and University of Peradeniya, Sri Lanka²—Functional attributes of the root holoparasitic genus *Hydnora*.

Hydnora is one of the strangest plant genera in the world. *Hydnora* spends the life below the soil, except when flowering of some species. It is almost entirely African in distribution. The plant consists of an extensive network that traverses the soil around the host plants (mainly *Euphorbia* and *Acacia* spp.). *Hydnora* spp. are without chlorophyll and completely dependent on hosts for nutrition and water. Even though a number of studies have been conducted on the morphology and the habit of this genus, very little is known about the functional attributes and the growth and development. We selected *H. triceps* and *H. africana* for a comparative anatomical study to unravel the form and function of this genus. Here we report the cellular arrangement of vascular tissues, meristems, reproductive structures and the haustoria responsible for maintaining the intimate connections between

Hydnora spp. and host plant roots for the acquisition of water and nutrients required for the survival of the parasite.

- 111 HAMISSOU, MIJITABA. Jacksonville State University—Molecular analyses of cadmium toxicity in *Arabidopsis*, and sorghum.

Cadmium is a non essential heavy metal pollutant of the environment, resulting from agricultural practices, mining, and industrial activities. It is also released into the environment by automobile exhaust gases. Cadmium is a very toxic metal because of its high water solubility, making it readily available for uptake by plants and aquatic animals. In plants, Cd has been shown to interfere with the uptake, transport, and use of several essential elements causing complex nutrient deficiency symptoms. Cd appeared to be absorbed passively and translocated freely through other plant body. The exact physiological and molecular mechanisms of Cd toxicity or tolerance are still not well understood. It is believed however that, like other heavy metals, the toxic actions of Cd is believed to be exerted on metabolic enzymes through altering their active sites. The effects of Cd on photosynthetic apparatus and on selected metabolic enzymes will be researched in the dicot, *Arabidopsis thaliana* and the monocot *Sorghum bicolor*. Preliminary data indicated that Cd causes chlorosis followed by necrosis in sorghum and *Arabidopsis*, and an alteration protein synthesis. The activities of isolated chloroplasts indicated that Cd interferes with the functions of the chlorophyll a and chlorophyll b.

- 112 POLLARD, A. JOSEPH AND CHRISTINE R. DONHARDT. Furman University—Genetic variation in nickel hyperaccumulation in the *Alyssum serpyllifolium* complex from the Iberian Peninsula.

Hyperaccumulation of heavy metals is known in approximately 400 species of plants worldwide, most of which grow on ultramafic (serpentine) soils and hyperaccumulate nickel. The *Alyssum serpyllifolium* group in the Iberian Peninsula is especially interesting: hyperaccumulators are known from isolated ultramafic regions in southern Spain, northwestern Spain, and northern Portugal, while a non-accumulating variety is widespread throughout the peninsula on limestone soils. These plants appear to be closely related, either all conspecific or else a complex of closely related sister species. We grew plants from seed and tested their ability to accumulate nickel under controlled hydroponic conditions in the laboratory, examining variation between and within populations. Some of the tested populations were known to hyperaccumulate nickel in the field. Others do not accumulate in the field because they grow on non-metalliferous substrates, but their physiological ability to do so is unknown. In our experiments, plants collected from known hyperaccumulator populations showed the highest nickel concentrations. Plants from limestone sites had lower nickel concentrations, but they were still quite high in comparison to typical plant values. Genetic variation within populations was tested by comparing maternal sibships. Significant variation was found in one population growing near Madrid, which included several sibships that did not accumulate strongly and at least one sibship of hyperaccumulator plants. Knowledge of genetic variation in hyperaccumulation may be key to understanding the evolutionary origins and practical applications of this phenomenon.

- 113 BRAY, AMANDA, MICHAEL LAND, JAMIE CHERRY AND TYLER CHANCE. Northwestern State University—Use of the chicken embryo bioassay for isolated embryo pathogens modified with fluorescent protein producing plasmids.

The chick embryo bioassay has not been widely used for many years. However, this test has many attributes which make the procedure an ideal tool for testing the effects of agents that cause the mortality in many biologic systems. This study utilized the most common bacterial pathogen isolates from local layer houses. The pathogens were

transformed with a fluorescent protein producing plasmid and injected into the eggs on days 1 and 14. The development of the embryo was followed until death was occurred. The embryos were examined and the organs were viewed under an ultraviolet light microscope to determine the organs most affected by the pathogen in question.

- 114 LAND, MICHAEL, FRANK YRLE, BRENT HARDY AND CODY COLE. Northwestern State University—Isolation and quantitation of mortality causing pathogens in commercial egg laying houses.

Embryonating egg mortality is a major economic factor for the poultry industry. While there are several factors that can contribute to the death of the developing chick, bacterial pathogens are the most common cause of mortality for the industry. A pathogen survey of bacteria on eggs at commercial layer houses was conducted. The most common pathogens were identified and their minimal infective dose concentration determined by the chick embryo assay. Embryos were injected at days 1 and 14. The resulting deaths were recorded and histopathologic examinations were conducted.

- 115 DEES, WILLIAM¹, JONATHAN DAVIS² AND JULI TRTANJ³. McNeese State University¹, Dynamics Technology, Inc.² and National Oceanographic and Atmospheric Administration³—Redefining disease surveillance: Integrated methodologies for infectious disease control.

Infectious disease surveillance is becoming increasingly complex owing to a number of factors, which include change and loss of habitats worldwide; interaction of humans with domestic animals, wildlife, and disease vectors; and increased global trade and travel. Geographic information systems (GIS) and disease and mathematical modeling are becoming standard tools for monitoring human health in light of pathogen mutagenicity and changing climatic and environmental factors. These novel surveillance systems integrate disparate types of data and help predict, detect, or monitor disease trends, forecast the onset or spread of disease outbreaks, and facilitate epidemiologic investigations, response measures, and strategic planning. Appropriate education and training involving working knowledge and understanding of remotely-sensed information analysis, public health, and current GIS technology are critical to developing new disease surveillance tools that activate prevention programs and mitigate the impact and spread of infectious agents. This presentation will address multidisciplinary approaches to using geographic information systems in public health. The future of GIS for disease risk assessment will be discussed.

- 116 ELLIS, JOSHUA, MELISSA HARRISON, JACKIE DELASH, BRIAN SPARKS, GREEN BERRY STARNES IV AND ALAN F. SMITH. Mercer University—Preliminary studies in the detection of *Borrelia burgdorferi*, *B. lonestari*, and *Ehrlichia* spp. from individual *Ixodes scapularis* collected from white-tailed deer of the Piedmont National Wildlife Refuge.

Over 1000 adult and nymphal ticks were collected from the carcasses of freshly harvested, white-tailed deer (*Odocoileus virginianus*) at the check station during two prescribed hunts (Oct. 21-23 and Nov. 4-6, 2004) in the Piedmont National Wildlife Refuge (Jones Co., GA). Southern black-legged ticks (*Ixodes scapularis*) comprised the overwhelming majority of the tick species, although lone star ticks (*Amblyomma americanum*) were well represented (~10%). The goal was to secure a sizeable sample of *I. scapularis*: the standard sweeping technique heretofore had yielded insufficient numbers of this species in our region. Maintained individually at -20 °C, total genomic DNA was extracted from single specimens and aliquots provided templates for the PCR-generation of agarose-gel-electrophoretic identifiable amplicons. Primers were designed from specific gene sequences as follows: a 378-bp *Borrelia* spp. FLA-1 gene fragment; a

459-bp *Borrelia burgdorferi* (Lyme disease) rOmpA gene fragment; a 247-bp *Ehrlichia* spp. 16s rRNA gene fragment; and a 900-bp *Ixodes* spp. nuclear ribosomal gene cluster fragment (ITS2). The rOmpA and FLA-1 amplicons allowed us to distinguish between the two ixodid-borne borreliæ since OmpA is absent in *B. lonestari*. The presence of the *Ixodes*-specific amplicon confirmed the quality of the genomic extraction such that *Borrelia*- and/or *Ehrlichia*-free samples could be distinguished from poorly-extracted or absent templates. The identity of the PCR products was confirmed by sequencing of the agarose gel-purified amplicons. Faculty Research and Development Grants from the College of Liberal Arts, Mercer University provided funding for this project.

- 117 DELASH, JACKIE, MELISSA HARRISON, JOSHUA ELLIS, BRIAN SPARKS, GREEN BERRY STARNES IV AND ALAN F. SMITH. Mercer University—Prevalence of the causative agents of Lyme disease, STARI, and Ehrlichiosis in male, lone star ticks collected from five middle Georgia counties.

During the spring through fall months over a two-year (2003 - 2004) period, male lone star ticks (*Amblyomma americanum*) were collected from five middle Georgia counties (Bibb, Jones, Houston, Monroe, and Crawford) by sweeping vegetation with cotton batting or from the carcasses of recently harvested white-tailed deer (*Odocoileus virginianus*) during prescribed hunts. Maintained individually at -20 °C, total genomic DNA was extracted from single specimens and aliquots provided templates for the PCR-generation of agarose-gel-electrophoretic identifiable amplicons. Primers were designed from specific gene sequences as follows: a 378-bp *Borrelia* spp. FLA-1 gene fragment; a 459-bp *Borrelia burgdorferi* (Lyme disease) rOmpA gene fragment; a 247-bp *Ehrlichia* spp. 16s rRNA gene fragment; and a 158-bp *A. americanum* ubiquitin gene fragment. The two sets of *Borrelia* primers allowed us to distinguish between the *B. burgdorferi* and *B. lonestari* spirochaetes since the latter lacks the rOmpA gene. Moreover, inclusion of the lone star tick-specific PCR step served as an additional control accounting for the quality of the genomic extraction: *Borrelia*- and/or *Ehrlichia*-free samples could then be readily distinguished from poorly-extracted or absent templates. The identity of the PCR products was confirmed by sequencing of the agarose gel-purified amplicons. Faculty Research and Development Grants from the College of Liberal Arts, Mercer University provided funding for this project.

- 118 YOST, MARLENA C.¹, BRIAN S. DORR² AND LINDA M. POTE¹. College of Veterinary Medicine, Mississippi State University¹, USDA/APHIS/WS National Wildlife Research Center, Mississippi State, MS²—Conformation of *Bolbophorus damnificus* life cycle and characterization of all life Stages.

A study was done to confirm the life cycle of *Bolbophorus damnificus* and compare it to the known life cycle of *B. confusus*. American White Pelicans (*Pelecanus erythrorhynchos*) were infected with *B. damnificus* metacercariae from infected catfish (*Ictalurus punctatus*). After subsequent patent trematode infections were established, ova were collected and used to infect trematode negative *Planorbella trivolvis*. Cercariae shed from these infected snails were used to infect parasite-free catfish. Metacercariae from these infected catfish were fed to trematode negative pelicans and allowed to mature to the adult stage. *B. damnificus* adults were isolated from the small intestine, completing the life cycle. Each life stage of this parasite was confirmed morphologically and using molecular techniques. This research provided further evidence that *B. damnificus* is a distinct species from *B. confusus* and the causative agent for trematode associated deaths in catfish.

119 PIGLIUCCI, MASSIMO. SUNY-Stony Brook—Is evolution a logical fallacy?

The neo-Darwinian theory of evolution is the currently accepted paradigm to explain the history and diversity of life on earth. Yet, ever since the publication of Darwin's *Origin of Species* it has been under attack on a variety of grounds. Some of these criticisms have been put forth in the philosophical arena, where evolutionary theory has often been accused of being incoherent or logically fallacious. I will examine some of the most common accusations of logical inconsistency in the theory, showing why they are unjustified, and in the process attempting to explain more clearly what evolution is all about.

120 FORREST, BARBARA. Southeastern Louisiana University—Inside Creationism's Trojan Horse: a closer look at Intelligent Design.

Intelligent design creationists at the Discovery Institute's Center for Science and Culture present themselves as scientists and scholars concerned with good science and science education. Promoting "intelligent design theory" as a "full-scale scientific revolution," they claim to be on the cutting edge of new scientific research. Contrary to these claims, however, intelligent design is merely the newest evolutionary variant of traditional American creationism. "ID" creationists have made no original contributions to science to support their contention that the purposeful activity of a supernatural designer explains biological phenomena better than natural processes. This is not their true aim. Rather, the movement's leaders are motivated by a desire to translate personal religious preferences into public policy, and they are making steady progress toward this goal. Fewer than a dozen states currently remain exempt from their attempts to influence either science standards, curricula, or textbooks. When approaching school boards and state boards of education, they disguise their creationist agenda with seemingly innocuous terminology that they coopt from legitimate scientific and educational discourse. Lucratively funded by sympathetic benefactors, ID creationists work through a well established network of local, state, and national religious organizations and religious/political operatives. Their political connections include members of Congress and close presidential advisors. The changes they hope to bring about in American public policy reflect their religious exclusionism and anti-secularism. If they succeed in advancing their vision of American culture and politics, serious damage will be done both to science education and to church and state separation.

121 EDIS, TANER. Truman State University—Chance and necessity—and Intelligent Design?

The "intelligent design" (ID) movement's core concern is not biology—it is establishing intelligence as an separate principle alongside chance and necessity. Functional complexity is, ID proponents think, the signature of intelligence, and intelligence cannot be a product of mere physical processes. They attack Darwinian evolution because it is the best developed and most critical element in naturalistic explanations of creative novelty. Scientifically, ID fails, not only because evolutionary biology remains a robustly productive and progressive enterprise, but also because Darwinian evolution has taken root outside of biology. Wherever physicists, cognitive scientists, and computer scientists seek to explain creativity and complexity within the natural world, Darwinian ideas appear. Recent research gives us strong reasons to think intelligent design is reducible to chance and necessity, and that broadly Darwinian processes are vital to creativity in general. ID, therefore, is a complete scientific non-starter.

122 MILLER, KEITH B. Kansas State University—Countering public misperceptions of evolutionary science.

Challenges to modern evolutionary science are often rooted in fundamental misperceptions of the nature of science itself. Among the public, there is a widespread perception that the focus of science on natural cause-and-effect explanations is a thinly disguised effort to promote a godless worldview, rather than an inherent methodological limitation. Furthermore, theories are commonly viewed as merely unsubstantiated guesses, rather than as the unifying concepts that give our observations coherence and meaning. Theories within the historical sciences, in particular, are seen as being inherently untestable. Science for many is simply an encyclopedic accumulation of unchanging observational "fact." The dynamic nature of science with the continual revision of theoretical constructs becomes evidence of the fleeting validity of scientific "truth." Much of the critique of evolutionary theory is also predicated on completely false views of its theoretical content and observational foundation. For example, the common charge that the fossil record lacks the required transitional or intermediate forms is based on erroneous views of the nature of the fossil record, the manner in which species are classified, and the expectations of evolutionary theory. There is little public understanding of the diverse range of observational data from the fossil record, biogeography, comparative anatomy, developmental biology, genetics, and molecular biology that makes sense only in the context of common descent. Too often the grand patterns of nature become obscured in public debate. The future of scientific literacy will depend on how we respond to these misperceptions as scientists and educators.

- 123 BLOOD, JACOB, KATHERINE MACKEY AND JONATHAN AKIN. Northwestern State University—Behavioral implications of tail status in ground skinks.

Tail autotomy is a major anti-predator adaptation in many lizards, including ground skinks. However, the loss of a tail may affect (1) the physiology of the lizard as lipid stores are lost and (2) the behavior of the lizard in terms of its foraging strategy. A tailless lizard may become less active because of depleted energy reserves and more sedentary as it is less likely to take any risk that may expose it to predation. In this study we examined the behavioral implications of tail loss in social interactions between adult lizards. We compared the tendencies for aggressive behaviors among lizards with intact tails, lizards with recently-autotomized tails, and lizards with regenerated tails. We found that aggression was most frequent among the lizards possessing their original tails and least frequent among those that had autotomized their tails.

- 124 ROSIER, HEATH AND JONATHAN AKIN. Northwestern State University—Adult-juvenile interactions in ground skinks.

Populations of ground skink lizards are age-stratified with individuals of adults, juveniles, and hatchlings present year-round. Very little information is known about the interactions among adults and smaller-sized age classes, such as juveniles and hatchlings. While aggressive behavior is more common in males than in females in adult behaviors, we examined in this study the prevalence of aggression in adult encounters with juveniles. We found that male adults continued to be aggressive towards juveniles but the effect of juvenile gender remained unknown as the sex of juveniles could not be determined at the time of the study.

- 125 HOFFPAUIR, CURTIS AND JONATHAN AKIN. Northwestern State University—Implications of insect repellent use in observing ground skink lizards.

Chemodetection is a sensory ability important to autarchoglossan lizards in a variety of behavioral contexts. An important application of chemosensory discrimination is in detecting real predators, such as a bird, or perceived predators, such as humans. In field settings, the scent of humans may reduce lizard sightings and potential captures. Avoidance behavior by lizards of humans may be reduced by application of colognes or

sprays, such as insect repellent. We tested the chemosensory response, measured as the number of tongue flicks, of ground skink (*Scincella lateralis*) lizards exposed to olfactory samples of distilled water, food-scent, cologne, and insect repellent. In addition, we compared sighting and capture data on collecting trips for ground skinks when using no repellent versus after repellent application. We found that lizards not only smelled the insect repellent but showed some degree of avoidance behavior when exposed. These results indicate that care must be taken when sampling natural population of lizards while using insect repellent.

- 126 MEYER, HARRY A. AND MARK A. PAULISSEN. McNeese State University—Temporal variation in a Mediterranean gecko population from a stable habitat.

The Mediterranean Gecko, *Hemidactylus turcicus*, is a small, introduced, nocturnal, insectivorous lizard found on buildings along the Gulf Coast of the United States from Texas to Florida. In 1999 we began a mark-recapture study of geckos living on a one-story building on the campus of McNeese State University in Lake Charles, Louisiana. The population of adult geckos on the building fluctuated considerably from 1999 to 2004. The abundance of adults rose from 99 (0.24 m⁻²) in 1999 to nearly 400 (0.93 m⁻²) in 2003, and then declined to 162 (0.39 m⁻²) in 2004. Juvenile lizards (young of the year) have not been recaptured sufficiently to estimate their population. Body condition (the residual of the regression of the log of snout-vent length on the log of body mass) also varied during this period. Body condition in both male and female adults during the same period peaked in 2000 and has declined significantly since.

- 127 NOEL, KRISTA AND CARL QUALLS. University of Southern Mississippi—Intrinsic versus extrinsic causes of low hatching success of gopher tortoise (*Gopherus polyphemus*) eggs in south Mississippi.

Recent studies have found that federally threatened gopher tortoises in south Mississippi suffer from low recruitment, due in part to very low hatching success of their eggs. We sought to determine if the cause(s) of this low hatching success was related to egg quality (intrinsic factors), unsuitability of the nest environment (extrinsic factors) or a combination of the two. In 2003, hatching success was monitored for eggs that were artificially incubated in the laboratory and for eggs left to incubate naturally in nests. The artificial incubation trial allowed us to estimate the proportion of eggs that were capable of hatching under favorable nest/environmental conditions. Hatching success in the laboratory was compared to that of eggs incubated in natural nests to estimate the proportion of eggs that failed to hatch due to extrinsic factors. Laboratory hatching success was 58.8%, indicating that roughly 40% of the eggs were intrinsically incapable of hatching even when incubated under favorable conditions. Hatching success in natural nests was only 16.7%, which was significantly lower than hatching success in the laboratory. This suggests that an additional 43% of eggs were capable of hatching but failed to hatch due to some extrinsic aspect(s) of the nest environment. Thus, the low hatching success of gopher tortoise eggs in south Mississippi appears to be attributable to a combination of intrinsic (egg quality) and extrinsic (nest environment) factors. Further research is underway to determine the specific intrinsic and extrinsic causes for the failure of such a high proportion of eggs.

- 128 MCKENNEY, CHRISSIE AND CARL QUALLS. University of Southern Mississippi—Nest site selection by gopher tortoises in south Mississippi.

Populations of the gopher tortoise, *Gopherus polyphemus*, (a federally threatened species) are declining in the western portion of their range. In the Desoto National Forest of Mississippi, where they are listed as endangered, populations suffer from low recruitment, largely as a result of low hatching success. Nest conditions can have profound effects on hatching success and hatchling survival, and an ongoing study has

shown that the nest environment appears to be responsible for the failure of many eggs. We compared several environmental aspects of nest sites to those of comparable nearby sites (adult burrow aprons) that did not support nests, to examine whether female tortoises appeared to preferentially nest in sites with particular attributes. Nest sites had lower tree canopy cover than non-nest sites, with significantly lower means and variances for cover for total, east, south, and west exposures; thus, nest sites were restricted to the lower end of the distributions of canopy cover values. The soils in this portion of *G. polyphemus*'s range have a greater clay content than those in more eastern parts of their range, and soils at nest sites had significantly lower clay content than at non-nest sites. There were no significant differences in habitat type (forest vs. open field), topography (slope and aspect), or the exposure aspect of burrow entrances between nests and non-nest sites. These results suggest that female tortoises disproportionately nested in, and hence may be choosing, nest sites with lower clay content soils, and that maximize the solar insolation of their nests.

- 129 VINDIGNI, M., J. KEMPISTA AND M. SCHAUS. Virginia Wesleyan College—Nitrogen and phosphorus release by turtles in a pond ecosystem: roles of time since feeding, mass, and taxon identity.

We examined the roles of several taxa of turtles in the nutrient cycles of Lake Taylor, on the campus of Virginia Wesleyan College (Virginia Beach, Virginia). Our objectives were to examine the degree to which nutrient release rates varied 1) with time since feeding, 2) due to turtle mass and 3) among taxa. We hypothesized that excretion rates would decrease with time since feeding and that mass-specific excretion rates would decrease with increasing turtle mass, as has been observed for fishes. Excretion measurements during May-Oct. 2003 demonstrated that total dissolved N and P excretion decreased substantially with time since feeding in Painted Turtles (*Chrysemys picta*) and Red-eared Sliders (*Trachemys scripta elegans*). We also observed that mass-specific excretion rates decreased significantly with increasing mass, and that mass appeared to be more important than taxon identity in determining excretion rates. Mark-recapture measurements estimated turtle abundance so that measured excretion rates could be expressed per m² of lake area. Lakewide excretion measurements by the turtle assemblage were comparable to those observed for fishes, likely due to high turtle biomass. Funding was provided by the Jessie Ball DuPont fund through the VFIC.

- 130 SCHOTZ, ALFRED. Alabama Natural Heritage Program—The rediscovery of *Lindera melissifolia* (Pondberry) in Alabama.

Federally listed as endangered in 1986 by the U. S. Fish and Wildlife Service, pondberry (*Lindera melissifolia* [Walt.] Blume, Lauraceae) is a low growing shrub that is currently known to inhabit bottomland forests and the margins of seasonally flooded depressions in 18 counties of seven states in the southeastern U. S. Until recently, the presence of this species in Alabama assumed a mythical status, having not been observed in the state since its original discovery in Wilcox County in 1840 by Samuel Buckley. In August 2004, two occurrences of *Lindera melissifolia* were located in Covington County approximately 16 km south-southwest of Opp, associated with a complex of lime sink depressions under a partially open canopy of *Nyssa biflora*, *Quercus laurifolia*, and *Ilex myrtifolia*. This sighting represents the first report of this rare species from Alabama in nearly 165 years.

- 131 McMULLEN, CONLEY K. AND ERIN E. CULPEPPER. James Madison University—*Cordia lutea* (Boraginaceae), an example of heterostyly in the Galápagos Islands.

Cordia lutea Lam. (Boraginaceae) is a Galápagos native that is also known from mainland Ecuador and northwestern Peru. This small tree or shrub (to 8 m) typically occupies the

arid lowlands and provides one of the archipelago's few, showy floral displays. Consequently, more reports have been made of insects visiting this plant's flowers than for any other Galápagos species. Although previous studies on the reproductive biology of this species have been conducted in the archipelago, no mention has been made of it being heterostylous. Because of this gap in the knowledge of this species' reproductive biology, it was decided that further study was required for a more complete understanding of its life history. Pollination experiments, flower-visitor observations, nectar studies, fluorescence studies, pollen measurements, and pollen-ovule ratio studies were conducted on this species. Results suggest that the breeding system of this species is xenogamy, in which the majority of flowers set fruit via outcrossing. Details of the breeding system are discussed. Not only are reproductive studies of island angiosperms of theoretical interest, they are crucial for a complete understanding of the population dynamics of indigenous plants. As human impact in the archipelago increases, it is important to gain an understanding of why some species are thriving, while others are in danger of disappearing.

- 132 HURT, KYLE D., RACHAEL B. SULKERS, JEFFREY L. WALCK AND SITI N. HIDAYATI. Middle Tennessee State University—Effects from the removal of the exotic species *Ligustrum sinense* (Oleaceae) on native vegetation.

Nonnative woody shrubs, primarily *Ligustrum sinense* Lour. are targets of an eradication program at the Stones River National Battlefield in Rutherford County, Tennessee. This effort has been largely focused in the redcedar woodland surrounding cedar (limestone) glades. Management involves hand-cutting of plants and application of herbicides to stumps. Ten 1-m² plots were established at 5 m intervals along 50-m transects placed into each of the following sites: (1) *L. sinense* removed by Battlefield staff, (2) *L. sinense* removed by volunteers, (3) untreated, heavily invaded by *L. sinense*, and (4) untreated, noninvaded by *L. sinense*. Density and cover of woody exotics significantly ($P \leq 0.05$) decreased on treated sites. Although richness, density, and cover of native trees and shrubs in the staff-treated site were significantly higher than the volunteer site, neither one differed significantly from the invaded site. However, richness, density, and cover of native herbaceous plants significantly decreased on both treated sites apparently due to trampling. The staff site resembled the noninvaded site in terms of richness, density, and/or cover of native trees, shrubs, vines, forbs, and graminoids but not ferns. Coverage of leaf litter was significantly lower in the treated site than in the noninvaded one. Regeneration of native trees and shrubs in the staff site was similar to that in the noninvaded site, but woody exotics had a dramatically higher amount of regeneration. Although management practices have been effective in removing *L. sinense* from the woodland community, continued efforts will be needed for full recovery of the vegetation.

- 133 HELD, MICHAEL E.¹, JOE E. WINSTEAD² AND WILLIAM S. BRYANT³. Saint Peter's College¹, Southern Arkansas University² and Thomas More College³—Thirty Years On: Recovery dynamics of a tornado-damaged forest in Boone County, Kentucky.

This 30-year study reports on the changes in the structure and composition of an old-growth forest after a windstorm in 1974. Tree density, basal area, and species composition were measured in Dinsmore Woods, an old-growth maple dominated forest in Boone County, Kentucky in 1974, both prior to and following a tornado, and then subsequently in 1985, 1994 and most recently in 2004 to assess the recovery patterns. Tree density and basal area declined from 1974 to 1985 but increased in 1994 and 2004. Species composition of the tree layer changed from 1994. *Acer saccharum* was still the dominant species, but the subdominant layer was now composed of *Fraxinus americana*, *Celtis occidentalis*, several *Quercus* species, *Juglans nigra* and *Liriodendron tulipifera*. The dominance of *A. saccharum* was seen in all strata (tree, sapling, and seedling). The

disturbance appears to have increased the dominance of *A. saccharum* and the dominance has been maintained for 30 years. The close similarity of the basal areas documented in 1974 and 2004 of approximately 30 m²/ha indicates the development or degree of forest stability in a forest preserve in this mixed hardwood Ohio River basin habitat.

- 134 JOHNSON, SARAH. E. AND CLAUDIA L. JOLLS. East Carolina University, North Carolina—The effects of competition on the threatened dune annual, *Amaranthus pumilus* Raf. (Amaranthaceae).

The influence of competition on population dynamics and community structure is not well understood for unproductive and stressful environments such as the coastal dune system. *Amaranthus pumilus* is a rare dune annual described as a fugitive species that establishes in the highly dynamic foredune habitat of the U.S. Atlantic Coast. We conducted a target-neighbor growth room competition experiment that assessed the effects of heterospecific associates (*Cakile edentula*, *Iva imbricata* and *Uniola paniculata*) and conspecifics on survival and growth of *A. pumilus*. The effects of neighbors on growth of *A. pumilus* were assessed by linear size metrics, relative growth rate and an index of total competitive response. *I. imbricata* neighbors had the strongest effect on *A. pumilus* success, followed by *U. paniculata*, *C. edentula* and *A. pumilus* conspecifics. Negative effects by heterospecific interactions were stronger and occurred sooner than effects by conspecific neighbors. Interspecific competitive exclusion of target *A. pumilus* plants occurred in the presence of the perennial neighbors, *I. imbricata* and *U. paniculata*. Intraspecific competition, however, did not affect survival of *A. pumilus*, but did result in reduced growth of targets through time. These data suggest that biotic interactions may be an important factor in the distribution of *Amaranthus pumilus*, especially at the upper limits of its vertical zone of establishment on the beach. Our research provides further experimental support for reduced competitive ability of annual species in unproductive environments.

- 135 CARTER, ROBERT¹, VICTOR SHELBURNE² AND LEAF KUNKEL¹. Jacksonville State University¹ and Clemson University²—Successional changes in plant species diversity on the Highlands Ranger District, Nantahala National Forest, North Carolina.

Plant species' diversity changes with succession were examined within ecological land units on the Nantahala National Forest, North Carolina. Shannon-Weiner Index revealed changes in diversity through time. However, further examination revealed that species diversity and species composition changes do not always correlate.

- 136 BRAGG, DON C. USDA Forest Service, Southern Research Station—A naturally-occurring *Pinus taeda* L. forest in the Mississippi Valley alluvial plain.

Loblolly pine (*Pinus taeda* L.), the most dominant conifer across the southern United States, grows on most Coastal Plain sites from Maryland and Delaware in the northeast to Texas in the southwest, but was historically absent from virtually the entire lower Mississippi Valley Alluvial Plain. A notable exception to this is a 1300 km² outlier of naturally-occurring loblolly pine found primarily in Monroe County, Arkansas. General Land Office (GLO) survey notes of this area from the 1820s and 1830s recorded pine-hardwood flatwoods intermixed with bottomland hardwoods and saline barrens. This unique ecological complex arose from the combination of microtopographical influences, unusual soil conditions, flooding, and probably periodic fire. For example, the soils of parts of the area naturally contain very high levels of sodium and magnesium, reaching phytotoxic levels sufficient to produce barren communities in otherwise rich, moist alluvium. Some of the GLO pine witness trees exceeded 90 cm in diameter. None of the virgin pine survived the logging and agricultural land clearing that followed Euroamerican

settlement, however, self-replacing stands dominated by loblolly pine have continued to this day. Several rare species are also present, notably Drummond's stitchwort (*Minuartia drummondii* (Shinners) McNeill), grassleaf ladies'-tresses (*Spiranthes praecox* (Walt.) S. Wats.), and red-cockaded woodpeckers (*Picoides borealis* Vieillot). The Arkansas Natural Heritage Commission has purchased approximately 175 ha of loblolly pine-dominated communities in three tracts, and is currently attempting to restore historical vegetative conditions using controlled burns.

- 137 BOLIN, JAY F. AND LYTTON J. MUSSELMAN. Old Dominion University—Community structure after 18 years of prescribed fire in a Virginia longleaf pine (*Pinus palustris*) sandhill.

The Blackwater Ecological Preserve (BEP) in western Isle of Wight County, VA is the last intact stand of naturally reproducing *Pinus palustris* in Virginia. This preserve represents the current northern limit of the *Pinus palustris* – *Quercus laevis* community type. After a half-century of fire suppression prescribed fire was introduced. Three growing season and three winter burns were applied since 1986. In October 2004 the effects of the prescribed fire treatment on canopy, sapling-shrub, and understory strata were quantified using nested quadrates in burned and adjacent unburned control areas. Results for the canopy stratum indicated a shift from a pine-hardwood stand to a monogeneric *Pinus* stand. In the control plots, hardwood canopy cover and density were 13.1% and 32.6%, respectively. The sapling-shrub stratum was dominated by *Nyssa sylvatica* and *Quercus laevis* in the control plots (0.25 m²-BA/ha) and was absent in the burned plots (0.0 m²-BA/ha). The understory stratum was dominated by ericaceous shrubs in control and burned plots. A significant 5.9 fold increase in total stem density was observed in burned plots. Herbaceous stem density increased three fold in burned plots but decreased relative to total stem density. Understory species richness was not significantly affected by the treatment. However, fire management of this system has maintained conditions for the maintenance of many state rare and threatened plants.

- 138 CLINE, GEORGE R., FRANK A. ROMANO III, KELLY D. GREGG AND JAMES R. RAYBURN. Jacksonville State University—Tropical Biology: an integrated science field experience.

Tropical Biology and Geography Study Tour are two courses taught concurrently by faculty from Biology and Physical and Earth Sciences. These courses are only taught in May, when faculty are encouraged to teach 'experimental' courses. While enrollment has been limited to 24 students, we have had 16 students each of the times that these courses have been taught. Lectures are given in the mornings for about the first 10 days of the session. Lectures focus on species ecology and identification, data collecting and reporting methods, geologic history of the area, coastal process, and coral reef formation. Afternoons are spent in the university pool practicing water skills and proper use of snorkeling gear. An exam is given in each class on the final day of lecture, and the students are taken to a local quarry/dive site for a final test of their water skills prior to the field trip. Ten snorkel activities are conducted in fresh- and salt-water beginning in the Florida panhandle and extending down the Florida Keys to the Dry Tortugas over a ten day trip. Both diurnal and nocturnal snorkel trips are conducted. Additional activities include an airboat ride in the Everglades, trips to archeological sites, a hike through the canopy of a sub-tropical forest, and a hike through portions of the Everglades. Total cost of the trip is ~\$600, plus tuition and meals on the road.

- 139 DAVISON, PAUL G. AND PAUL D. KITTLE. University of North Alabama—A reliable method for observing the protrusible pharynx in planarians.

A technique for studying the feeding behavior of planarians utilizes a micro-aquarium designed as a culture vessel suitable for microscope, hand lens, and naked eye use. Planarians maintained within a micro-aquarium for several days without food readily demonstrate feeding behavior when appropriate food is offered. Foods we recommend are Betta fish food granules and other sinking-type fish food, fragments of living *Lumbriculus*, and aquatic insect larvae (mosquitoes, mayflies, and chironomid midges). Live food (prey) is more desirable because planarians actively immobilize their prey before they penetrate it with their pharynx. To observe nearly instantaneous feeding behavior, food can be positioned within the near vicinity of planarians with the aid of a plastic positioning tool (McDonald's coffee stirrer or similar strip of rigid plastic). The ventral side of a planarian from which the pharynx extends is typically hidden from view as the animal orients dorso-ventrally. Once feeding has begun, the micro-aquarium is simply flipped over for viewing the ventral surface and the protruding muscular pharynx. Polypharyngeal species of *Phagocata* are especially interesting to observe. We have maintained individual planarians, fed on average once a month, for seven months and longer.

- 140 EAKIN, DAVID A. Eastern Kentucky University—If Creationism is religion—can we bash it in the public classroom?

Six significant Court decisions serve as the basis of this presentation. The teaching of Creationism in the classroom is an issue bearing on the separation of Church and State. The intent of these decisions was to prevent the use of public school classrooms as a forum to promote religion (Creationism). In practice, many classrooms are being used as a forum to bash Creationism. This raises critical questions of legality for school systems and puts individual teachers, departments and schools at risk. On the basis of such legal precedents the author suggests that Creation-bashing is as unlawful in the public school classroom as would be the defamation of Islamic or Judaic beliefs.

- 141 ALIFF, JOHN VINCENT. Georgia Perimeter College, Gwinnett University Center—Making sure that science and religion get proper respect.

Science and religion have different methods of knowledge and objectives. Religion proceeds from supernatural revelation, it states morals and rules for ethical decision-making, and answers questions about the meaning of life. Science proceeds from the observation of nature and attempts to explain natural phenomena. This author considers both to be valuable as traditionally practiced. Creationists criticize the "naturalism" of science. Intelligent design theory assumes that evidence of the intricacy of nature is evidence for its "design." A hypothesis of design is not testable using the scientific method since testing a hypothesis that is outside of nature is not possible, regardless of whether the designer(s) are space aliens or a God. The scientific creationist procedure to read modern meanings into Bible verses (eisegesis) will be compared to the traditional theological method of determining the original meaning of Bible verses (exegesis). Creation science attempts to change the traditions of science and academic theology by means of a popular political revolution that demands religious confirmation of science and scientific confirmation of religion.

- 142 STOCKS, STEPHANIE D., BARBARA J. SPEZIALE, JAMES K. ZIMMERMAN, ROBERT E. BALLARD, JOSEPH D. CULIN, EDWARD B. PIVORUN, TIMOTHY P. SPIRA, JOHN R. WAGNER, JERRY A. WALDVOGEL AND GREG K. YARROW. Clemson University—Incorporating science technology with field-based lesson plans to enhance natural history education for classrooms both indoors and outdoors.

Through a grant to Clemson University by the Howard Hughes Medical Institute Undergraduate Biological Sciences Education Program, the SC LIFE Project supports

education and outreach programs that incorporate natural history and other life science studies in South Carolina's classrooms. We have developed several field based lesson plans with teachers and scientists which target middle school science curriculum standards and highlight South Carolina's flora and fauna. Because few schools own sufficient equipment to accomplish the more technologically advanced SC LIFE lessons, we have assembled 6 Natural History Equipment Footlockers which contain over 50 pieces of scientific equipment including: a computer, insect collection equipment, mammal skulls, an environmental datalogger, a digital stereoscope, a GPS unit with mapping software, and a digital video camera. Teachers undergo a 1 week graduate level course to learn how to operate the equipment and how to use the accompanying lesson plans. They can then request the footlocker for up to 4 months at a time for use at their school.

- 143 EAKIN, DAVID A. Eastern Kentucky University—Using Scantrons™ to communicate caring in the large classroom setting.

Grading tests by the use of optically read answer sheets, e.g., the Test Scoring Machine (TSM), fosters a feeling of impersonality in the student/teacher relationship. This is especially true in our largest classrooms where the use of OCR sheets greatly facilitates the turn around time from test to grade. Yet it is possible to turn these seemingly faceless answer sheets into a tool that demonstrates caring and concern on the part of instructors. Using examples from his own classes, the author will share his technique for improving student perceptions of fairness and caring when using such impersonal forms. Some surprising responses and tangential benefits in course administration will be discussed.

- 144 JUETT, BEVERLY W. AND JOHN DELFINO. Midway College—Student ratings of learning practices in anatomy and physiology I.

In the fall of 2002, students in Anatomy and Physiology I used seven different learning practices relating to the subject matter including group work, worksheet questions, diagrams, quizzes, test reviews, crossword puzzles, and study guides/lecture outlines. At the end of the semester, each student rated the learning practices as most beneficial to least beneficial. Students showed a preference for learning practices, rating the study guides/lecture outlines and test reviews as the most beneficial. This preference was not associated with age or major.

- 145 STOCKS, STEPHANIE D., BARBARA J. SPEZIALE, JAMES K. ZIMMERMAN, ROBERT E. BALLARD, JOSEPH D. CULIN, EDWARD B. PIVORUN, TIMOTHY P. SPIRA, JOHN R. WAGNER, JERRY A. WALDVOGEL AND GREG K. YARROW. Clemson University—The use of virtual field trips and interactive CDs to enhance natural history education in the classroom.

Through a grant to Clemson University by the Howard Hughes Medical Institute Undergraduate Biological Sciences Education Program, the SC LIFE Project supports education and outreach programs that incorporate natural history and other life science studies in South Carolina's classrooms. Because class field trips have become increasingly difficult for teachers to conduct, we have developed several virtual field trips for the students to experience. In partnership with S.C. Educational Television (SCETV), we developed the first four titles in our virtual field trip series: Salt Marsh, Cove Forest, Swamp Forest, and Sandhills. With technology and computers becoming a larger part of the middle school curriculum, we have also developed a series of interactive CDs designed to support SC LIFE field-based lesson plans. In addition, in light of the need for teachers to become more technologically advanced in the classroom, we conduct a 2 week course during the summer for them to learn how to make their own interactive CDs in support of a lesson plan of their design.

- 146 RAYBURN, JAMES R., GEORGE R. CLINE, FRANK A. ROMANO III AND KELLY D. GREGG. Jacksonville State University—Fish and invertebrate survey in a field exploratory class: Tropical Biology.

Tropical biology is an extensive field trip to study the flora and fauna of tropical regions. The class includes lectures and snorkel training. During the lectures we stressed identification species emphasizing coral reef fishes and invertebrates. The class visited sites along the Florida Gulf Coast from the panhandle (St. Andrews Bay) to the Florida Keys and the Dry Tortugas. The class snorkeled with manatees, on coral reefs and sea-grass beds. Over 100 species of fish and over 100 kinds of invertebrates were identified. The students observed new species/taxa for the class list each day. The course utilized a Reef Fish Survey Form available from Reef Environmental Education Foundation as a model for all surveys conducted in the class. This survey increased classes' interest and helped the class understand the importance of collecting these data. The class was challenging for both students and professors as the number of species in the different habitats increased. This total immersion in identification of organisms in different ecological niches gave the students a more comprehensive "real world" understanding of threats to the worlds' reefs.

- 147 BRIGHT, S. KRISTEN, ZACK MURRELL AND TERRY CARROLL. Appalachian State University—Application of ATBI protocols to faith-based facilities: a model for implementation.

The protocol of an ATBI (All Taxa Biotic Inventory) has been established on a large scale in the Great Smoky Mountain National Park. This effort has helped identify and discover species and illuminate ecological concerns for the area. We have recognized a need to provide this kind of information for areas that are smaller in size that would benefit from implementing ATBI strategies of data collection and distribution. Specifically, we have targeted faith-based facilities that have access to significant natural areas and desire to 1) appropriately steward these sites, and 2) provide ecological training in addition to more traditional religious training at the facility. Using the traditional and structured approach, as defined by current ATBI protocol, we have developed a methodology to implement an ATBI at Lutherock, owned by the Evangelical Lutheran Church in America (ELCA) that is used as a summer camp for faith-based studies of all ages. We have begun an assessment of the taxonomic and ecological diversity at the site. The 365 hectare area has seven dominant community types. Based upon our inventory efforts, we have been able to provide advice on development, use and conservation of the area. We have developed teaching modules that can be used by the on-site summer naturalist. As we develop this protocol for this site, we have taken the opportunity to construct this in a general way that can be used by other similar facilities. We contend that faith-based facilities are an untapped resource for conservation and environmental education.

- 148 CARTER, M.E.B., S.C. BAKER AND T.W. WADE. Oxford College of Emory University—"I will be fearless as a teacher!" Lessons from teaching and learning with investigations.

Begun in 1992, the Oxford Institute for Environmental Education has successfully assisted more than 200 teachers to become comfortable and successful schoolyard educators. Beginning in 1996, as part of the ESA/ASB partnership, we instituted drastic changes in how the Institute was taught that led to significant improvements in teacher engagement and an increased confidence in teaching science, managing students outdoors, and understanding fundamental concepts in ecology. Teachers who complete the workshop are actively engaged in developing investigations, practicing the scientific process, and presenting their results. Many integrate inquiry-driven approaches and ecological content in teaching language arts, social studies, and art. We will present two versions of specific

environmental education activities, for example, a stream and a wetland investigation. The use of case studies and participant-designed investigations has increased teacher engagement and their enthusiasm for teaching and doing science in their classroom. Sample case study investigations will be available.

- 149 SAUTERER, ROGER, MARY MILLWOOD AND SHAKA SHAKES. Jacksonville State University—Analysis of waters and sediments near the Anniston, AL, Monsanto site by FETAX, extended FETAX, and immunoblotting against CYP 1A.

Waters and soils in Anniston, AL are contaminated by PCB-laden runoff from landfills at the local Monsanto plant. Despite clean-up efforts, soils, waters and the blood of local residents still have elevated levels of PCBs. In order to assess the effects of current PCB contamination on aquatic organisms, we are analyzing the development of the frog *Xenopus laevis* when exposed to control solutions, waters and aqueous sediment extracts from streams near the Monsanto site. The standard Frog Embryo Teratogenesis Assay – *Xenopus* (FETAX) shows subtle but significant growth inhibition in embryos exposed to contaminated waters and sediment extracts, though mortality and malformation rates are not affected. Because anuran embryos are relatively insensitive to the effects of PCBs and dioxins during the first five days of development and become more sensitive later, we are developing an extended modification of the FETAX assay where embryos are exposed to samples for two weeks or more. Preliminary results indicate embryos raised in contaminated Snow Creek water for 17 days have a higher mortality rate and more lethargic behavior compared to the controls. Additionally, since exposure to PCBs induces the enzyme Cytochrome P-450 1A (CYP 1A), we are attempting to detect CYP 1A in microsome-enriched embryo extracts by immunoblotting in order to determine if CYP 1A induction occurs in embryos raised in contaminated samples. Current data shows limited detection of CYP 1A and no evidence of increased CYP 1A levels in embryos raised 2 or more weeks in Snow Creek water compared to the controls.

- 150 MCCOLLISTER MATTHEW AND TRAVIS PERRY. Furman University—Flying nocturnal insect communities in burned and unburned coniferous forests of the Sacramento range, New Mexico.

Forest ecosystems change constantly in response to disturbance events which may vary in frequency and intensity. Fire is perhaps the most frequent and widespread agent of disturbance in southwestern forests. This study examined the effects of forest fire on nocturnal flying insect abundance, species richness, and diversity in the Sacramento mountains of New Mexico by comparing light-trap samples collected in burned and unburned forest habitats. In addition, correlation analyses were performed between the aforementioned community measures and temperature, days since last rain, fullness of the moon, cloud cover, and wind speed. No significant differences were found with respect to any community measure between burned and unburned forest. However, significant correlations were found between community measures and environmental factors. As there may be autocorrelation among environmental factors further study is needed. There may be at least two reasons, inherent to the study, which explain similarities in the insect community between burned and unburned forest. First, the fire occurred three years prior to the study and succession may have mediated the initial effects of fire. Second, light traps may have drawn insects into areas they would not ordinarily inhabit.

- 151 EVETTE, MIKE AND TRAVIS PERRY. Furman University—Fire ants (*Solenopsis invicta*) as biological control agents on an organic farm.

The imported red fire-ant (*Solenopsis invicta*, first introduced during the 1930's from South America, is widely considered to be a pest. However, a few studies have investigated the

potential of *S. invicta* as a biological control for agricultural pests. This study examined whether *S. invicta* decreased infestation and damage by the corn ear-worm (*Heliocoverpa zea*). The study was conducted in a 10m x 18m plot of sweet corn on an organic farm in Saluda County, South Carolina during the summer of 2004. We used TangleFoot (The Tanglefoot Company, Grand Rapids, Michigan) to exclude *S. invicta* from 19 corn plants and allowed free access to 19 others. Plants were randomly chosen for each category. We found no significant difference in corn worm numbers between the two treatments, nor did we find a significant difference in the number of worm damaged ears per plant. However, we did find a marginally significant difference in the extent of damage per damaged ear as measured by actual number of damaged kernels ($t=1.609$; $df=39.073$; $p=0.058$). Density of *S. invicta* was unusually low in our study plot during 2004. Effects may have been greater at higher ant density. These results suggest the potential of *S. invicta* to act as a biological control agent on small organic farms. Further research is warranted.

- 152 PILARCZYK, MEGAN M.¹, HOLLY N. BLALOCK-HEROD², PAUL M. STEWART¹ AND BONNIE L. HAMITER¹. Troy University¹ and U.S Fish and Wildlife Service, Panama City, FL²—Host identification of the tapered pigtoe mussel (*Quincuncina burkei*) and the fuzzy pigtoe mussel (*Pleurobema strodeanum*) at Eightmile Creek in Walton County, Florida.

The southeastern United States supports the greatest diversity of unionids in the world, yet little is known about the reproductive biology of many of these freshwater mussels. This study assessed the host specificity for two candidate mussel species, *Quincuncina burkei* (Wright) and *Pleurobema strodeanum* (Walker). Populations of both species were monitored and checked monthly for gravidity from December 2003 to December 2004 at Eightmile Creek in Walton County, Florida. Gravid females of both species were collected in the spring of 2004, held in an aquarium at the Troy University laboratory until completion of the host fish trial, and then returned to Eightmile Creek. Over the course of 18 trials, 10 different fish species were exposed to *P. strodeanum* glochidia in a bath consisting of glochidia and water for about 15 minutes. The same procedure was repeated over the course of 10 trials to expose six different fish species to *Quincuncina burkei* glochidia. In two trials, glochidia from *P. strodeanum* transformed into juveniles on *Cyprinella venusta*. During one of the trials, *Q. burkei* glochidia transformed into juveniles on *C. venusta*. The results of this preliminary study suggest that *C. venusta* is likely a host fish species for both *Q. burkei* and *P. strodeanum*.

- 153 HEATH, WILLIAM H.¹, JONATHAN M. MILLER¹, PAUL M. STEWART¹ AND THOMAS P. SIMON². Troy University¹ and Indiana Biological Survey²—Habitat partitioning of crayfish assemblages in wadeable streams in the coastal plains of southeast Alabama.

Alabama has one of the most diverse crayfish assemblages in the world, and are among the most threatened groups known: yet little research is being done to improve management and conservation practices. Crayfish (Decapoda: Cambaridae) are a large portion of the total invertebrate biomass and play a key role in energy exchange among trophic levels. The objective of this study is to examine habitat partitioning of crayfish assemblages by determining habitat preference and selection among species. Fifty wadeable sites, within the Choctawhatchee, Pea, Yellow, and Patsaliga Rivers watersheds, were selected that had representative crayfish habitats. Crayfish were captured by means of backpack electrofishing while recording their substrate, depth, in-stream cover, and stream partition of origin. Six species in two genera were found. *Procambarus suttkusi* (Hobbs), *Procambarus versutus* (Hagen), and *Procambarus spiculifer* (LeConte) were the most common species, and were found in a wide range of habitats. The most common habitat was woody debris over a sand substrate. Other common habitats included overhanging vegetation, cobble/rocks, and root mats. Position

in the stream was dependent on available cover. *Procambarus okaloosae* (Hobbs) was a rare find, and not enough information was collected to make an accurate assessment of habitat patterns. *Cambarus latimanus* (LeConte) made use of available habitats, but was rarely found with other species.

- 154 DUGUAY, JEFFREY P.¹ AND CHERYL FARFARAS². Delta State University¹, Howard County Department of Recreation and Parks²—A four-year investigation of plant and invertebrate response to management of an overabundant suburban deer population in Maryland.

White-tailed deer (*Odocoileus virginianus*) overabundance is a problem of serious concern for managers. At densities as low as 8 deer/km², negative ecological impacts have been reported. The Middle Patuxent Environmental Area (MPEA) in Howard County, Maryland had an estimated deer population of 31 deer/km² in the late winter of 1998. Managed hunts reduced the population to an estimated size of 8 deer/km² by fall 2002. During the fall of 1998, 10 20m x 20m deer exclosures were established in the MPEA. During the summers of 1999 and 2003 herbaceous vegetation, seedling recruitment, and shrub cover was sampled in each exclosure (treatment plot) and in a 20m x 20m area adjacent to each exclosure (control plot). Invertebrates were sampled in both the litter and shrub layers. No differences existed ($P > 0.05$) in vegetation or invertebrate samples between treatment or control plots in 1999. In 2003, however, there was significantly more ($P < 0.0001$) vegetation and forb cover in the treatment than control plots. Invertebrate biomass did not differ ($P = 0.7423$) between the treatment and control plots in 2003. Examination of vegetation variables between 1999 and 2003 indicate that shrub cover increased and total number of stems and percent forb cover decreased within both the control ($P < 0.0001$) and treatment plots ($P = 0.0003$). Likewise, invertebrates increased from 1999 to 2003 ($P < 0.0001$). Regression analysis indicated a significant relationship ($R^2 = 0.30$, $P = 0.0118$) between invertebrate biomass and amount of shrub cover for 1999 but not 2003.

- 155 DUBOIS, ADRIENNE AND TRAVIS PERRY. Furman University—Potential geographic variation and sexual dimorphism in ecomorphology of the pallid bat (*Antrozous pallidus*).

Previous studies have documented geographic variation in sexual dimorphism with respect to the cranium of the pallid bat (*Antrozous pallidus*). The cranium, specifically craniodental morphology, is an indicator of ecological function. However, the mandible may be a better indicator of trophic ecology as its associated moment arms contribute to bite force efficiency and, by extension, may in part determine optimum prey types. In this study we examined the lever arm ratios between the coronoid process (input lever) and various mandibular teeth (output levers) for males and females across elevational and latitudinal gradients. Patterns in mandibular biomechanics across gender and geographic space will be discussed.

- 156 CARROLL, AMANDA D. AND KIM MARIE TOLSON. University of Louisiana at Monroe—The effects of silvicultural and hydrological practices on breeding bird communities in northeast Louisiana.

Breeding Bird Surveys (BBS) were conducted on Ouachita (OWMA) and Russell Sage Wildlife Management Areas (RSWMA) in Ouachita Parish, LA. Both WMA's are located within bottomland hardwood forest habitat. These bottomland hardwood habitats are subjected to periodic flooding throughout the year – both naturally and intentionally to create greentree reservoirs (GTR) and moist-soil units (MSU). Each WMA is divided into numerous compartments based on the silvicultural or hydrological practice implemented in that area. There are nine different management techniques practiced on OWMA as compared to only five on RSWMA. Point counts ($n = 48$ OWMA; $n = 39$ RSWMA) were

sampled on established transects from April 2003 through early July 2003 and from April 2004 to early July 2004 to determine the breeding bird species present on each WMA. Objectives were to: 1) determine the presence (richness) of breeding birds, 2) compare the species similarity between the two WMA's, and 3) identify any effect of management practices on breeding birds. Total species richness was 81 on OWMA and 57 on RSWMA. Forty-eight of the 57 species found on RSWMA were also detected on OWMA, giving a Sorenson's similarity coefficient of 0.70. The data being presented are from a two year study supported by funds provided by the Louisiana Department of Wildlife & Fisheries (LDWF) and the United States Fish & Wildlife Service (USFWS), Division of Federal Aid through the State Wildlife Grants Program.

- 157 CARPENTER, JOHN P¹, YONG WANG¹, ADRIAN A. LESAK¹, CALLIE JO SCHWEITZER², ERIC C. SOEHREN³ AND MARK SASSER³. Alabama A&M University¹, US Forest Service² and Alabama Department of Conservation and Natural Resources³—Status of the cerulean warbler (*Dendroica cerulea*) in northern Alabama.

The Cerulean Warbler (*Dendroica cerulea*) has experienced a severe population decline in the eastern United States during the last 40 years, including a continual disappearance of breeding populations in Alabama since the 1970's. During an unrelated avian study conducted in 2002 by Alabama A&M University and the US Forest Service (USFS), a Cerulean Warbler breeding population was discovered in Jackson County, Alabama. In addition, the Alabama Department of Conservation and Natural Resources had been conducting breeding bird surveys (BBS) since 1999, with an emphasis in locating Cerulean Warblers in Bankhead National Forest (BNF) of Lawrence County, Alabama. In 2004, we implemented a study to investigate the status of the Cerulean Warbler in northern Alabama and surveyed for the species at potential breeding habitats. We report here the status of three Cerulean Warbler breeding populations: one in BNF and two in northwest Jackson County. Bird locations were mapped using topographical maps and a Global Positioning System (GPS). From 1999-2004, we located a total of approximately 50 defended territories, two fledglings, and four nests (two unsuccessful and two fates unknown). The future goals of this project include further surveying of Cerulean Warblers at potential breeding habitats in northern Alabama, monitoring its breeding success, determining associations of Cerulean Warblers with other bird species, and examining relationships between the occurrence of Cerulean Warblers and land-use and habitat features.

- 158 MILLER, JONATHAN M., WILLIAM H. HEATH AND PAUL M. STEWART. Troy University—Morphological Variations among burrowing crayfish in the *Cambarus diogenes* (Girard) complex.

Crayfish (Decapoda: Cambaridae) are among the most threatened fauna on the planet and little information is available regarding this group in the southeastern United States. Among these, due to the difficulty in sampling that requires hand excavation, are those primary burrowers in the species complex *Cambarus diogenes* (Girard). No life history studies have been performed on this complex. The objective of this study is to determine the varying morphological characteristics of the members of the species complex. Ten *C. diogenes* are excavated monthly at each of three sites within the upper Choctawhatchee River watershed to observe variations in male and female reproductive structures, color patterns, and chela and carapace characteristics. Representative variations of first form males, second form males, and females are preserved monthly from these sites for voucher specimens. Sampling has shown us that there are at least three forms in the watershed that all key out to *C. diogenes*. Further studies are needed to express the differing characteristics and define these variations as new or sub-species.

- 159 ENSIGN, WILLIAM E. Department of Biological and Physical Sciences, Kennesaw State University—Why fish can't cross the road: The effect of culvert design on fish movements in small Etowah Basin streams.

In areas experiencing urbanization, road-building, particularly culvert design and placement, can subdivide fish populations. To investigate the effects of culvert design on fish movement, 14 small streams in the Etowah river basin were sampled in 2003 and 2004. Fish were collected from continuous reaches directly upstream and downstream of culverts with a backpack electroshocker, tagged with a fluorescent elastomer tag, and released. Unique combinations of tag color and position allowed assignment of marked fish to the reach of original capture. Approximately one month later, fish were collected from the same reaches and inspected for tags. Physical characteristics of culverts separating upstream and downstream reaches were measured, including culvert length, type, slope and the height of downstream drop. Results showed drop height is the most important variable limiting movement of fish. Of the 14 streams sampled, 4 had drops at the downstream end of the culvert greater than 5 cm. The percentage of recaptured fish moving either upstream or downstream across the culvert in these streams averaged 2.7% (range = 0.0% - 5.6%), while the percentage of fish moving across "dropless" culverts averaged 12.3% (range 0.0% - 23.6%). Culvert slope may play a secondary role in limiting fish movement. There was a single stream without a drop at the lower end of the culvert where there was no movement, however culvert slope in this stream was the highest of all the sampled sites (2.4%). Based on these results, culvert designs that incorporate drops at the downstream end should be avoided.

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ABSTRACTS – POSTERS

- P1 BELLANCEAU C.B. AND G.R. HUXEL. University of South Florida—Diversity of arthropods in the University of South Florida Ecological Research Area in Tampa, Florida.

Leaf litter samples and pitfall traps were used to study arthropod diversity in the University of South Florida Ecological Research Area. Arthropods were collected from different plots of different prescribed burn frequencies (1 year, 2 year, 5 year, 7 year and no burn frequencies). Short-term responses (within days to months), of arthropods, to fire was also studied after the 1 year plots were burned. Interactions among arthropods, as well as differential responses of herbivores/pollinators, detritivores, and predators/parasitoids to burn frequency were studied. The effectiveness of collection type was also studied by comparing the use of leaf litter sample collection with pitfall trap use. Preliminary results suggest that there are short-term and long-term differences among arthropod communities in response to fire history and vegetation. Pitfall traps are more effective for sampling arthropod diversity.

- P2 GROGHAN, SHERI AND ROBERT CARTER. Jacksonville State University—Species richness and relative abundance of small mammals in green pitcher plant bogs of the Little River National Preserve, Alabama.

Species richness and relative abundance of small mammal populations in green pitcher plant (*Sarracenia oreophila*) bogs was examined through catch and release techniques. The results revealed a diverse species assemblage that changed seasonally. The results provide baseline information for understanding the relationship between animal and plant populations in green pitcher plant bogs.

- P3 NIX, ELIZABETH A¹., MICHAEL K. MOORE¹, ALAN F. SMITH¹ AND VICTOR W. TOWNSEND, JR², ¹Mercer University, ²Virginia Wesleyan College—Animal diversity and food web structure of a tank bromeliad fauna from Trinidad, W. I.

Phytotelmata, aquatic habitats held within various plant parts, have emerged recently as model systems in testing hypotheses in the field of community ecology. Recent studies have demonstrated the usefulness of these systems in the characterization of food web structure and in making animal diversity comparisons between regions. The animal communities present in epiphytic bromeliads are relatively discreet, simple and allow the feeding links to be characterized with a high degree of accuracy. The fauna are typically dominated by arthropods (insects, arachnids, and crustaceans) with some annelids and an occasional vertebrate (e.g., larval anuran) as members. We removed 20 epiphytic bromeliads of a single species from the canopy of a tropical evergreen seasonal forest near Petite Tacaribe, Trinidad, W. I. Epiphyte data collected included sample height in the canopy, individual plant height, and central tank volume. All animals encountered in each bromeliad were collected and characterized to a specific taxonomic level. Individuals were identified to the specific taxonomic level that allowed for characterization of feeding-relationships. In addition, to facilitate diversity analyses, all individuals were placed into specific morphospecies groups. We collected 396 individuals in 49 species and 12 orders. Diptera (larvae; 35% of all species) and Coleoptera (20%) were the most abundant, with Araneae and Hymenopterans (both groups at 8%) less common. An additional 8 orders were represented at 4% or less. In addition, we will provide a discussion of food web structure, a characterization of diversity, and make comparisons to other recent results of bromeliad community studies.

- P4 BARANSKI, MICHAEL J. AND KIM MARIE TOLSON. University of Louisiana at Monroe—An avian phenology study of two wildlife management areas in northeast Louisiana.

Traditional management objectives on wildlife management areas (WMA) in Louisiana have focused on the enhancement of game species. Due to a paucity of information on non-game species, the first step in proper management of non-game birds is to identify all avian species present. A phenology study was conducted on Buckhorn Wildlife Management Area (BWMA) in Tensas Parish and Sicily Island Hills Wildlife Management Area (SIHWMA) in Catahoula Parish to determine the avian species richness and abundance on a monthly basis. BWMA encompasses 4,558 ha of a mixture of bottomland hardwoods while SIHWMA consists of 3,037 ha of high ridges containing loblolly-shortleaf pine and upland hardwoods. Bird species identified are categorized based on their status of occurrence: breeding, winter resident, spring/fall migrant, occasional/rare. Established breeding bird point counts ($n = 42$ BWMA; $n = 36$ SIHWMA) were conducted from March 2003/2004 through June 2003/2004. Beginning in March 2003 weekly birding trips were conducted to compile monthly data on species richness and abundance. Total species richness found on BWMA is 155, and on SIHWMA is 107. An avian calendar is being constructed that will illustrate bird species present and their abundance for each month of the year. The data being presented are the final results of a study supported by funds provided by LDWF & USFWS, Division of Federal Aid through State Wildlife Grants Program.

- P5 SMITH, CARLY AND TRAVIS PERRY. Furman University—Bat foraging rates in burned and unburned coniferous forests of the Sacramento range, New Mexico.

Bats emit characteristic echolocation calls in the final seconds of approaching a prey item. This distinct series of sounds is called a feeding buzz. By recording feeding buzzes with electronic equipment in a given habitat researchers may estimate foraging rates. We used a ANABAT II Bat Detector system (Titley Electronics Pty Ltd, Ballina, NSW, Australia) to compare bat foraging rates between unburned forest habitats and forest habitats that were burned in the summer of 2000. In addition, we examined correlations between feeding rates environmental variables: temperature, moon fullness, days since last rain, cloud-cover, day of the year, and wind speed. We found no significant differences in feeding rates between the two forest types. However, we found significant correlations between foraging rates in both habitats and cloud cover ($r = -0.303$, $p < 0.27$), day of the year ($r = -0.287$, $p < 0.035$), moon fullness ($r = -0.233$, $p < 0.071$ (marginal)), and days since last rain ($r = 0.286$, $p < 0.035$). Because there is reason to believe that these environmental variables are themselves correlated, further studies are needed to determine more precise relationships.

- P6 EDWARDS, THOMAS III¹, DENNIS HANEY¹, VICTORIA TURGEON¹ AND MICHAEL CARABALLO². Furman University¹ and Universidad Metropolitana²—Metallothionein synthesis and physiological bio-indicators in fish exposed to zinc in the upper Enoree River, South Carolina.

While the acute effects of zinc on aquatic organisms have been well studied, comparatively little is known about the long-term effects of zinc on fish health. In 1985 an industrial retainment pond in northwestern South Carolina ruptured, spilling over 75,000 liters of spent galvanizing waste containing zinc and other contaminants into the headwaters of the Enoree River. Elevated zinc concentrations still affect animals living in the river. We first examined metallothionein production induced by relatively high zinc concentrations (0.31-1.22 ppm) in the bluehead chub (*Nocomis leptoccephalus*). Fish were collected from four sites in the upper Enoree River, and metallothionein in gills and livers was isolated using SDS-PAGE and semi-quantitative western blot analysis with the rabbit

anti-cod metallothionein polyclonal antibody. Tissues were also examined histologically for metallothionein localization. Fish collected from waters with the highest zinc concentration expressed more metallothionein than the controls (0 ppm zinc). Metallothionein granules were found throughout the gill, with the majority of the localization confined to the stratum granulosum of the epithelium. In livers, metallothionein was concentrated around the portal veins, but not the portal arteries, perhaps aiding in the removal of waste and toxins. We also examined whether red-breasted sunfish (*Lepomis auritus*) collected at low zinc levels (0.04-0.6 ppm), would have depressed physiological and immunological functions compared to control fish (0 ppm zinc). As zinc exposure increased, overall health was negatively affected, with fish at 0.6 ppm exhibiting a lower condition factor and hematocrit, along with increased visceral and liver somatic indices.

- P7 MILLS, EDWARD, CRYSTAL MOORE, AND KATHERINE POWELL. Wingate University—Responses of aquatic invertebrate communities to habitat modification by beavers (*Castor canadensis*).

Changes in nutrient and sediment retention, and increased levels of organic material in the saturated soil beneath beaver (*Castor canadensis*) dam impoundments may alter invertebrate community species diversity, species richness, and community structure. Artificial leaf packs were constructed using a mixture of sweetgum, maple and oak leaves, and placed into onion mesh bags. These leaf packs were placed on creek bottoms within beaver impoundments, at nearby downstream sites, and at control sites away from beaver activity. Leaf packs were removed at regular intervals at each of the study sites. The remaining leaf material was searched, and aquatic macroinvertebrates were collected. We compared the species diversity & abundance, species richness, and community structure of macroinvertebrates at each location. In addition, the remaining leaf material was weighed to assess detritivore feeding efficiency at the three study sites. Because beaver dams alter water conditions, we measured several important habitat variables that may explain macroinvertebrate distribution: water depth, nitrogen and phosphorus levels, turbidity, color, dissolved oxygen, water temperature, percent organic material and sediment depth. These habitat measures may be correlated with invertebrate community diversity, abundance, species richness and proportions of different feeding groups present.

- P8 PHIPPS, SCOTT W. AND ERIC BRUNDEN. Weeks Bay National Estuarine Research Reserve—A comparison of floral assemblages from coastal wetland forest sites with different disturbance histories.

The Damson property is a 460-acre section of estuarine wetland forest and tidal marsh within the management area of the Weeks Bay National Estuarine Research Reserve. The Weeks Bay Reserve is a NOAA Trust Resource, a Gulf Ecological Management Site and designated an Outstanding Natural Resource Water. Portions of the Damson Tract have suffered hydrological alteration, introduction of exotic invasive species, and cumulative impacts from silviculture, row crop agriculture, and fire restriction. Within the Damson Tract is a 63-acre section containing a publicly accessible nature trail established for educational outreach and recreational purposes hereafter referred to as the Nature Trail site. The Nature Trail site is currently being restored. An extensive site characterization and monitoring program was initiated prior to restoration. The Nature Trail site was compared to a relatively undisturbed site (C1) and to a site that was subjected to silviculture but not row crop agriculture (C2). Floral surveys show sites are distinct with greatest diversity and evenness occurring in C1. More invasive exotic plant species were found in the most disturbed portions of the sites. Old-field succession appears to have been interrupted by invasive exotic species and changes in hydrology. Hydrologically altered areas with wetland soils held few obligate wetland species. This extensive characterization provides clear goals for assessing effectiveness of restoration efforts.

- P9 NOBLE, SARAH MARIE, JUAN M. LOPEZ-BAUTISTA, AND D. ALBREY ARRINGTON. The University of Alabama—Macroalgae from impacted and pristine tidal creeks on Andros Island Bahamas.

Macroalgae in the tidal creeks on Andros Island serve as habitat and food for economically important fish (e.g. "Nassau Grouper") and mollusks (e.g. "Queen Conch"). Some of the tidal creeks on Andros have been negatively impacted by anthropogenic activity such as bridge building and construction of roads. These activities limit algal diversity and growth upstream by disrupting hydrologic connectivity (e.g. tidal flow) and channel morphology. Baseline comparisons of the algal communities of two anthropogenically fragmented creeks (Man-O-War Sound and Staniard Creek) and two unimpacted creeks (Burying Peace and White Bight) are being compiled for use as references during ongoing tidal creek restoration.

- P10 OWENS, JANNA¹, ROBERT ANGUS¹, KEN MARION¹, SCOTT KNIGHT², AND ANDREW SIMON². University of Alabama at Birmingham¹ and USDA-ARS, National Sedimentation Laboratory²—Integrating sediment-related variables with biological assessments of rivers and streams: preliminary results from the Ridge and Valley.

Aquatic habitats are designated as a primary source of impairment for many listed surface waters, therefore, establishing links between aquatic populations and sediment-related variables is critical in developing watershed strategies. Although biological assessments are indispensable, impairment sources cannot be identified without associated variables quantifying physical parameters that relate to biologic functions. Our objective was to explore potential relations between biologic community structures and local-scale sediment and geomorphic processes. Biologic collections and habitat evaluations were conducted using the Rapid Bioassessment Protocol for three years at sites in the Alabama section of the Ridge and Valley. Rapid geomorphic assessments (RGAs) and identification of the stage of channel evolution were utilized to semi-quantify channel stability using a channel-stability index and to distinguish stable and unstable sites. This index can be used as an empirical surrogate for sediment load with higher index values representing greater instability and erosion, as well as higher sediment loads. Samples of bed-material particle size were collected to quantify the degree of fines deposition (embeddedness) within gravel-dominated substrates. Stable study sites, as indicated by low values of the channel-stability index scores, had low embeddedness values (<10%) and supported good aquatic communities as determined from a modified EPT index. Sites with the highest values of the channel stability index and embeddedness (15% or greater) had poor community structures. These data support the hypothesis that stream geomorphology and biological communities can be associated. Monitoring strategies that link stream geomorphic variables and biological data will serve to direct the remediation efforts for watersheds.

- P11 SHELTON, MICHAEL. Weeks Bay National Estuarine Research Reserve—Monitoring mercury in largemouth bass tissue in the Weeks Bay watershed.

Mercury in fish is a serious environmental concern. Fish River in the watershed of Weeks Bay is on the Clean Water Act §303(d) list impaired for mercury. A consumption warning (filets with 1 ppm or greater total mercury) was issued for largemouth bass (*Micropterus salmoides*) caught in the Fish River. Mercury monitoring in fish in the watershed had been limited. Testing of largemouth bass tissue was expanded to better understand contamination in the entire watershed and to isolate segments of the watershed to examine geographical differences in contamination. Bass were collected from Fish and Magnolia Rivers, their major tributaries and from isolated ponds in the watershed. Filets

from over eighty bass were tested for total mercury. Certain geographic areas contained fish with higher concentrations. North of County Road 32, over 80% of the bass tested exceeded the 1 ppm. In Polecat Creek, all bass collected ranging in age from three to six years contained high levels of mercury. Two to three year old bass caught in Fish River at Interstate 10 exhibited high concentrations. Less than a quarter of the bass caught south of County Road 32 contained high concentrations. Only the largest fish collected in the lower watershed exceeded the 1 ppm limit. Results of mercury monitoring indicate that mercury concentrations in bass are affected by their location in the watershed but not the size of the watershed draining area. Studies of the water column are underway to examine different conditions accounting for variation in tissue concentrations.

P12 SINGLETON, JOSH¹, DANNY MILLICAN² AND ²CHRIS TAYLOR. Shorter College¹ and Mississippi State University²—Detecting altered fish assemblages within environmentally modified locales of the Tombigbee River system

The Tombigbee River system is known to have supported a rich and diverse fish fauna of approximately 119 native species. Historically, the Tombigbee River system was characterized by dendritic flow from numerous headwater tributaries into a few mainstem channels that merged with the Tombigbee River throughout northeast Mississippi. Natural flow conditions were modified by the construction of a massive, 234-mile navigation channel that now connects the Tennessee and Tombigbee River systems. The Tennessee-Tombigbee Waterway (TTW) is regulated by ten locks and dams that segregate a series of pools, artificial canals, and long sections of channelized river. Large-scale alterations to the river's natural morphology and flow conditions have led to widespread ecosystem fragmentation and habitat loss for riverine fish species. The primary goal of our research is to survey fish biodiversity and environmental conditions within the entire system, including the least-impacted section of the Tombigbee River north of confluence with the TTW, in order to assess species-environment relationships.

P13 WARNER, CHARLENE AND MIN-KEN LIAO. Furman University—A quick measurement of genetic diversity within and between bunched arrowhead (*Sagittaria fasciculata*) populations using ISSR.

Since its debut on the endangered species list on July 25, 1979, bunched arrowhead, *Sagittaria fasciculata*, has become the focus of a preservation campaign by the South Carolina Department of Natural Resources. The bunched arrowhead is able to reproduce in two fashions: sexually and asexually. This variability in reproduction results in populations exhibiting varying levels of genetic diversity that is difficult to distinguish by examining their morphology. Therefore, the decisions for past acquisitions had not based on the genetic diversity of the populations for we had no means for determining if the subpopulations or populations were essentially the same or distinct from each other. It is apparent that the accurate measurement of genetic diversity or relatedness within and between populations is essential for management of protected sites and for evaluation of sites for future protection projects. The major goal of our study is to streamline a reliable procedure for assessing the genetic diversity of different bunched arrowhead populations. Using the techniques ISSR (inter-simple sequence repeats), we have identified at least two DNA primers that can effectively differentiate the genomic makeup of bunched arrowhead collected from different locations. Our preliminary results have shown that our current procedure generates sound, quick and reliable data in as short as a 24 hour time period. The authors thank Mary Bunch at the South Carolina Department of Natural Resources for providing samples and supplies.

P14 BOBOWSKI, CHRISTIE AND ELI V. HESTERMANN. Furman University—Combinatorial gene regulation by the estrogen and aryl hydrocarbon receptors.

The estrogen receptor (ER) is a ligand-activated transcription factor that promotes transcription in two ways. ER either directly binds to DNA at estrogen responsive elements (EREs) on gene promoters, or it stabilizes another transcription factor that in turn promotes transcription. Ligands of another ligand-activated transcription factor, the aryl hydrocarbon receptor (AhR), are known to have both estrogenic and anti-estrogenic effects in cells and animals. In order to explore these dual effects of AhR ligands, we exposed MCF-7 cells to estradiol (E2, an ER ligand) and/or TCDD (an AhR ligand) and measured the relative amounts of mRNA for four ER-regulated genes by real time RT-PCR. The genes cathepsin D (CATD) and EBAG9 are both directly regulated by the ER whereas *c-myc* and cyclin D1 (CCND1) are indirectly regulated by ER. As expected, there were high levels of expression of all genes in cells exposed to E2; however, there was also induction of gene expression in cells exposed to TCDD. This result supports recent findings that the ligand-occupied AhR can affect the ER in the absence of its ligands to cause transcription. In the presence of ER ligands, AhR ligands have been shown to inhibit the estrogenic response. We found this pattern in levels of EBAG9 and CATD; however, when cells were exposed to both TCDD and E2 the levels of *c-myc* and CCND1 were not significantly lowered versus E2 alone. This pattern of gene regulation suggests that AhR only inhibits ER function when ER interacts directly with DNA regulatory sequences.

- P15 MITCHELL, GEOFFREY C¹., XINHAI YANG², DONGHUI LIU², DAVID H. SHERR² AND ELI V. HESTERMANN¹. Furman University¹ and Boston University²—The aryl hydrocarbon receptor regulates *c-myc* transcription through direct binding to its promoter region in Hs578T breast cancer cells.

The aryl hydrocarbon receptor (AhR) is a transcription factor activated by environmental agents, including carcinogens, and is involved in the regulation of numerous genes. The AhR also has been shown to have a role in cell cycle progression from the G1 to S phase. In a variety of tumors, high levels of active AhR have been observed in the absence of any exogenous AhR ligands. Western blotting revealed that human breast cancer cells, from the cell line Hs578T, express larger amounts of active AhR in their nuclei than cells from the normal line, Hs578Bst. Hs578T cells were used to study the effects of active AhR on the regulation of *c-myc*, an oncogene involved in cell cycle progression, whose promoter includes six aryl hydrocarbon response elements (AhREs). Deletion of all six AhREs resulted in a four to five-fold increase in the activity of a promoter-reporter construct for *c-myc*. These data indicate that the AhR represses *c-myc* transcription in Hs578T cells. DNA from untreated Hs578T cells was recovered through chromatin immunoprecipitation (ChIP) and the region of the *c-myc* promoter 95 to 245 bp upstream of the transcription start site was amplified by real-time PCR. There was an almost twenty-fold enrichment of the IP fraction over the input control fraction, which shows that the AhR acts on *c-myc* through direct binding to its promoter region rather than through some other interaction. These findings allude to a mechanism by which the AhR can affect cell cycle progression and ultimately lead to tumor formation.

- P16 LANE, JESSICA G., LAUREN N. WHISENANT AND ALISON B. DIXON. Wingate University—Genetic influences on the Bruce Effect using laboratory and wild strains of mice.

Pregnancy Block in mice, known as the "Bruce Effect", is a naturally occurring phenomenon. Progesterone secretion necessary for pregnancy maintenance is inhibited when a pregnant female is exposed to a foreign male (not her mate). Recent studies have suggested that the genetics of the embryo may influence the ability of the foreign male to block pregnancy. The purpose of this study was to determine if the genetic variability of embryos influenced pregnancy block, fertilization failure, and early embryonic loss when pregnant females were exposed to foreign males. Female mice of the BALB/c strain were

mated with either BALB/c or C57BL strain and female mice of the CB6F1 strain (BALB/c x C57) were mated with CB6F1 males. Pregnant females were exposed to either a stud male, BALB/c male, or a male from the wild. On approximately day 18 of gestation, pregnancy rate, number of fetuses, and corpora lutea were determined and compared between mating groups. Preliminary results suggested that as genetic variability increased in offspring, the percentage of females that lost pregnancy decreased. There were no differences in percentage of pregnant females experiencing fertilization failure or early embryonic loss.

P17 WALLACE GERRY, STEFANIE RITTER AND VICTORIA TURGEON. Furman University—Trypsin localization in the developing avian neuromuscular system.

Serine proteases have been localized throughout many vertebrate body plans. Recent evidence suggests that these proteins may play a role in neuronal development. The purpose of this study was to understand the temporal and spatial location of one of these serine proteases, trypsin, in the developing neuromuscular system of chick embryos. Western blot analysis, immunohistochemistry and immunocytochemistry were used to quantify and pinpoint trypsin during the period of programmed cell death, axon formation, and synaptogenesis (embryonic days (E)5-E9). Immunohistochemistry detected the presence of diffuse trypsin in the neural tube on E2, floor plate on E4, and gradual localization into the ventral spinal motor horns from E4-E8. Western blot analysis confirmed trypsin's presence in the spinal cord with increasing intensifying from E6-E9. Furthermore, immunohistochemical and immunocytochemical findings show scattered trypsin localization in the target hindlimb skeletal muscle beginning at E5 and decreasing through E8. While the specific function of trypsin in the developing neuromuscular system has yet to be elucidated, these studies suggest that trypsin does play a role in the sculpting and wiring of the neuromuscular system.

P18 LYLES, KELLY AND VICTORIA TURGEON. Furman University—Trypsin inhibition in an avian motor neuron and skeletal muscle co-culture system does not alter neuromuscular junction formation.

While the mechanisms involved in motor neuron axon formation and synaptogenesis with target skeletal muscle cells is not entirely understood, recent evidence suggests that members of the serine protease family may play an essential role in these processes. Serine proteases possess the ability to degrade many components of the extracellular matrix making them excellent foraging proteins enabling axons to tunnel towards their targets. Trypsin, a serine protease which has been recently located within the developing spinal cord and whose receptor has been localized to the surface of skeletal muscle cells, is one such protein thought to mediate axon formation and target localization. In this study, motor neurons and skeletal muscle cells from developing chick embryos were established in a co-culture system that enabled observation of the developing neuromuscular systems. A trypsin inhibitor administered to either the motor neurons or skeletal muscle cells was used to block the effects of endogenous trypsin activity during the aforementioned processes. After 48 hours of development in culture, digital analysis of the co-cultures was used to determine motor neuron axon length, direction, and percentage of motor neurons forming axons. While no significant differences among the experimental groups were found for these three parameters, its temporal and spatial localization suggests that trypsin may still be involved in neuronal and/or neuromuscular junction development.

P19 LOUGHMAN, ZACHARY, CELESTE GOOD AND THOMAS K. PAULEY. Marshall University—Status of the West Virginia state collection of amphibians and reptiles.

In 1935, the West Virginia Academy of Science gave Neil D. Richmond \$100 to travel the state and collect amphibians and reptiles. These specimens and supplemental collections in 1937 and 1938 formed the beginnings of a state collection of West Virginia herpetofauna. Since Richmond was not associated with a museum or University, he lacked curatorial services and a building to hold the collections. To provide curatorial services the collections were moved to Marshall College in 1939 under the care N. Bayard Green. N. B. Green maintained the collections from 1939 – 1971. During this time, the collections grew from approximately 1,000 to over 5,000. Michael Seidel served as curator from 1971 to 1987. Thomas K. Pauley assumed the curatorship in 1987 and continues to provide curatorial services for the collection today. As of 2004, there are over 14,900 specimens, all available in an electronic database. The WV Division of Natural Resources, United States Park Service, and United States Department of Agriculture-Forest Service have provided financial service for the maintenance of the collection.

- P20 SUTTON, WILLIAM B., YONG WANG AND CALLIE J. SCHWEITZER. Alabama A & M University—Response of forest herpetofaunal communities to thinning and prescribed burning in mixed pine-hardwood stands in the William B. Bankhead National Forest, Alabama: study site description and methods.

My dissertation research will take place in Bankhead National Forest, an 182,000-acre multi-use forest in northwestern Alabama. Study design will consist of two-factor, randomized complete block design. Each of three tree thinning levels (no thin; $17\text{m}^2\text{ha}^{-1}$ residual basal area (BA); $11\text{m}^2\text{ha}^{-1}$ BA) will be exposed to three burn frequencies (no burn; 3-year burn; 10-year burn). Plots will be approximately nine hectares in size and will be replicated four times across the landscape. One year of pre-treatment data along with 2-3 years of post-treatment data will be collected. Multiple herpetofaunal monitoring techniques will be employed to ensure adequate sampling efforts. A single drift-fence trapping array composed of three 15m drift fences radiating 120° from a central triangular box trap will be placed at each plot. A single box trap will be placed at the terminal end of each drift fence (three per array). Two pitfall traps will be located at the midpoint of each fence (six per array). Three arrays of 20 small untreated plywood coverboards (30cm X 61cm) and three arrays of four large untreated plywood coverboards (61cm X 122cm) will be placed in each plot to monitor salamanders and other fossorial herpetofauna. To monitor pond breeding amphibians, artificial pools will placed in duplicate along the following distance gradient from treatment edge: 0m, 50m, and 150m. Additionally, diet analysis of eastern fence lizards (*Sceloporus undulatus*) will illustrate the effects of forest alterations on reptile species. Funding: Forest Service of United States Department of Agriculture.

- P21 ABERCROMBIE, VICTOR, JOSH SINGLETON AND RICKY FIORILLO. Shorter College—Amphibian diversity and reproduction in a vernal pond in Northwest Georgia.

Many amphibians breed in vernal ponds. These fishless ponds, usually associated with bottomland hardwood forest, are mostly dry in fall and fill in late winter or early spring. Unfortunately, many amphibian populations are declining as more of this critical habitat type is threatened or lost. We have identified a vernal pond in Marshall Forest, a 311 ac. natural preserve located in Rome, GA. We began monitoring this site for amphibian activity in spring 2004 with a drift fence and pitfall traps and have collected ~ 170 individuals representing 12 species. We report preliminary data on pond hydroperiod, amphibian diversity and timing of reproduction.

- P22 GOOD, CELESTE, DEBORAH MERRITT AND THOMAS K. PAULEY. Marshall University—A preliminary study of the use of man-made ponds for amphibian breeding in fragmented forested areas.

Amphibian populations are declining worldwide and major contributing factors to these declines are habitat loss, fragmentation, and degradation. We conducted a study to investigate the use of man-made ponds ($n=6$) in forested areas by breeding amphibians, specifically *Rana sylvatica* and *Ambystoma maculatum*, and the survival and movement of juveniles. Ponds were constructed in December 2002 in forested areas that will be cut into three fragmentation treatments (August 2006) in two compartments designated 7 and 9 of the MeadWestvaco Wildlife and Ecosystem Research Forest (MWERF). The three treatment types were: clear-cut to one hectare surrounding pond, clear-cut to one hectare surrounding pond with forested corridor remaining intact, and no treatment. Drift fences with funnel traps surrounded ponds to capture animals both leaving and entering. All amphibians captured were batch marked with pond specific tags using visible implant elastomers (VIE). In 2003, no amphibians bred in the ponds, therefore they were stocked with *R. sylvatica* and *A. maculatum* egg masses from a permanent pond located within the MWERF. *R. sylvatica* juveniles were caught emigrating from all but one pond. Twenty-seven juveniles were caught in compartment 9, while only three were captured upon leaving the pond in compartment 7. Numbers of *A. maculatum* captured were lower, with only 3 captures total, 2 in compartment 9, and 1 in compartment 7. *Rana clamitans melanota*, *Notophthalmus v. viridescens* and adult *Rana sylvatica* colonized ponds after the breeding season. Monitoring will be continued in successive seasons and results compared with post-cut data.

- P23 GOOCH, MICHELLE M.¹, AUBREY M. HEUPEL², STEVEN J. PRICE¹ AND MICHAEL E. DORCAS¹. ¹Davidson College and ²Iowa State University—The effects of survey protocol on detection probabilities and site occupancy estimates for summer-breeding Anurans.

Recent global declines in amphibian populations have created an urgent need for large-scale, long-term monitoring efforts and many anuran monitoring programs have been established that utilize volunteer-based calling surveys. Calling surveys can be effective monitoring tools; however, differences among survey protocols often bias survey results. Failure to take into account detection probabilities when monitoring anurans can lead to inaccurate inferences about site occupancy, since non-detections in survey data do not necessarily mean that a species is absent unless the probability of detection is 1. We used a likelihood-based method, in the form of the computer program PRESENCE, to estimate detection probabilities and site occupancy rates for summer-breeding anurans. Using detection data from calling-surveys, we evaluated how detectability and site occupancy for 5 anuran species were influenced by 1) time spent listening at each site and 2) number of surveys per site. We found considerable variation among species with regards to detection probability and site occupancy across time and survey period. Longer surveys resulted in more species detections; 13% of all species detections occurred after 3 minutes. We also found that detectability could be overestimated for short surveys due to the added number of sites where a species was detected with longer surveys, resulting in underestimates of site occupancy. Multiple surveys per site within a season that are longer than 3 minutes are necessary to eliminate biased detection probabilities and provide truer estimates of site occupancy. Our results emphasize the importance of evaluating detection probabilities for any long-term monitoring project.

- P24 ROMBOUGH, NIKKI, CHRISTOPHER BRENNAN AND MEGAN GIBBONS. Birmingham-Southern College—The affect of prior exposure to chemical cues of predator on antipredator behavior of *Hyla cinerea* tadpoles.

For aquatic amphibians, the expression of antipredator behaviors may be essential for survival. In many cases, chemical cues from predators are important triggers for eliciting antipredator behavior in prey. We conducted an experiment to determine if there was a

difference between antipredator behavior of green treefrog (*Hyla cinerea*) tadpoles with and without prior exposure to chemical cues from bluegill (*Lepomis macrochirus*). We collected tadpoles from an environment that did not contain fish, and separated them into two groups: (a) those that received 15 min of exposure to chemical cues of a predator (bluegill) that had been feed tadpoles the night before, and (b) those that received no exposure to predator cues. Tadpoles in these two groups were observed individually while in the presence of visual and chemical cues of a predatory bluegill for 15 min, during which time, antipredator behaviors were recorded. We also conducted a survival experiment to determine if prior exposure to predator cues enhanced the tadpoles' ability to avoid predation. Groups of ten tadpoles (all from the same exposure group) were placed in an experimental chamber with a bluegill predator and a refuge, and the number of surviving tadpoles was recorded after 12 hours. Results suggest that prior exposure to chemical cues from predators, even those predators that do not exist in the natural environment of the prey, may induce antipredator behavior.

- P25 DELECKI, ANISSA, GEORGE CLINE, JAMES RAYBURN AND MARK MEADE. Jacksonville State University—Metabolic rates in 24 hour old Cope's gray treefrog (*Hyla chrysoscelis*) larvae at three temperatures.

Hyla chrysoscelis are found throughout eastern North America west to Kansas, northward into Canada, and southward into Texas. *H. chrysoscelis* starts laying its eggs in late April or early May and continues throughout the summer. The oxygen consumption rates and metabolism of individual 24 hour old *H. chrysoscelis* larvae were measured at three different temperatures; 15, 20, and 25°C. The Q₁₀ rule states that with every 10 °C increase in temperature the reaction rate will double. If an ectotherm is exposed to different thermal environments without being permitted a choice, then the rates of its functions depend on environmental temperature. Therefore, the metabolic rate of anuran larvae should be lowest at 15°C with twice the rate at 25°C. For the three temperatures tested there were statistically significant differences in metabolic rate ($p= 0.039891$). The mean metabolic rates almost doubled from 15°C to 25°C therefore the Q₁₀ rule is applicable to anuran larvae.

- P26 PUCKETT, ROSEMARY E. AND NANCY J. BERNER. Sewanee: The University of the South—The effect of seasonal acclimatization on the standard metabolic rate of eastern red spotted newts (*Notophthalmus viridescens viridescens*).

Ectotherms are highly susceptible to changes in seasonal temperature. Because cold winter temperatures can be detrimental, ectotherms that stay active year-round, like the Eastern red spotted newt, must have some way to regulate their metabolism and adjust to these changes. This study questions whether observed seasonal increases in metabolic enzyme activity is reflected in seasonal increases in the newts' standard metabolic rate (SMR). Oxygen (O₂) consumption was used as the indicator for SMR. Newts, collected in summer, were fasted to assure SMR was obtained, and the animals were kept in natural light and summer temperature. These animals' O₂ consumption was determined using an Applied Electrochemistry S-3A/I O₂ analyzer at three acute temperatures (8°C, 16°C, 26°C) that mimic seasonal changes from winter to summer. Newts were maintained at the acute temperature for 2h before O₂ consumption data were recorded every minute for 30 min. Individual newts were tested at only one temperature per day. As expected, the SMRs of the newts increased as the acute temperature increased. To make a comparison of SMR between seasons, we will also examine winter animals. We expect that the O₂ consumption of winter animals will show the same acute temperature profile. We also expect that the SMR of winter newts will be higher at each acute temperature than that of summer newts, thus exhibiting acclimatization of their SMR in conjunction with acclimatization in enzymatic activity. Funding from the University of the South, Yeatman Summer Research Fellowship to REP.

- P27 BERNER, NANCY J., ROSEMARY E. PUCKETT AND BRADLEY J. WAFFA. Sewanee: The University of the South—Identifying possible structural differences in some metabolic enzymes of summer- and winter-acclimatized eastern red spotted newts (*Notophthalmus viridescens viridescens*).

Eastern red spotted newts are ectotherms, aquatic as adults, and active year-round, breeding even during winter. With changing seasons, they acclimatize the activity of some of their muscle's metabolic enzymes. Cytochrome c oxidase (CCO) and citrate synthase (CS) completely or partially (respectively) compensate during winter. Their activity is higher in winter than in summer at the same assay temperature. CCO activity from winter newts at 8°C is the same as for summer newts at 26°C. Lactate dehydrogenase (LDH) activity does not vary seasonally. The present study was conducted to investigate the nature of these changes, investigating the possibility of seasonally-produced isozymes. We ran native polyacrylamide gel electrophoresis (PAGE) of muscle tissue homogenates from summer and winter newts and stained for LDH activity. Blue-native PAGE was also performed and those gels stained for CCO activity. CS has proven intractable in PAGE thus far. We expect to find differences in the migration of enzymes from summer and winter newts if isozymes are present. In addition, we determined the Arrhenius break temperatures (ABT) for all three enzymes in summer and winter newts. We expect to find lower ABTs for enzymes from winter animals if isozymes are present. We expect to find no differences in electrophoretic patterns or ABTs if the differences in enzyme activity are due to changes in concentrations of enzymes rather than the presence of isozymes. We continue to study LDH as an internal experimental control. Funding from the University of the South Faculty Research Funds to NJB.

- P28 LOUGHMAN, ZACHARY, DEBORAH MERRITT AND THOMAS K. PAULEY. Marshall University—Black-bellied salamander (*Desmognathus quadramaculatus*) feeding ecology across the Southern Appalachians.

Desmognathine salamanders have received considerable taxonomic attention in recent years. While questions pertaining to taxonomic issues are being elucidated, basic natural history, such as prey preference and selection for many members of this tribe still remain unknown. Black-bellied salamander (*Desmognathus quadramaculatus*) prey habits were studied across the southern Appalachians. Ten *D. quadramaculatus* were collected from five sites, including one site in Virginia, North Carolina, Tennessee and 2 sites in West Virginia. Salamander stomachs were removed, and all stomach contents flushed into collection tubes. Contents were identified to order, and tallied for each salamander and for each site. Significant prey taxa diversity between sites was present, however, hymenopterans were the dominant forage for three (VA, NC, TN,) of 5 sites. Isopods and dipterans were each a dominant forage for both West Virginia sites. Most frequently encountered prey taxa among sites were hymenopterans, dipterans, and coleopterans respectively. Mean number of salamanders from each site containing prey items was 9, with 2 prey items representing the mean amount of prey per salamander. Results indicated that arthropods represented the dominant forage (100% of sites) for *D. quadramaculatus* sampled. Although frequently cited, no *D. quadramaculatus* sampled within this study had preyed upon sympatric salamander species. Based from results of this study, *D. quadramaculatus* appears to a dietary generalist feeding on the most frequently encountered prey items within its habitat.

- P29 MERRITT, DEBORAH, CHRISTOPHER BARRY AND THOMAS K. PAULEY. Marshall University—Comparison of age, size, and reproductive status of six populations of black-bellied salamanders (*Desmognathus quadramaculatus*).

The genus *Desmognathus* has received considerable attention from the herpetological research community in recent years because natural history and taxonomic studies have led to the conclusion that disparities in morphology between populations of salamanders across the southern Appalachians need to be addressed. We hypothesize that morphological differences between populations are likely a combination of environmental and genetic factors varying from habitat to habitat resulting in different growth and sexual maturation rates. Age at particular size classes, as well as size and age at maturation, were studied among six populations ($n = 10$) of *D. quadramaculatus* in Virginia, Tennessee, North Carolina and West Virginia. Both adult and juvenile salamanders were collected. Individuals were placed into three size classes; juvenile, sub-adult, and adult, based on their snout-vent length. Salamanders were dissected to determine sex and reproductive status, including number of testis lobes and follicle sizes. Skeletochronology was used to assess the age of each animal where cross-sections of the femoral diaphysis were examined to count the lines of arrested growth (LAGs). LAGs were assessed independently by both primary researchers in order to reach an objective conclusion of the age of the salamander. LAGs were compared to the size and reproductive status of each salamander across four states in the southern Appalachians.

- P30 CAMPBELL, SELENA AND RICKY FIORILLO. Shorter College—Effects of predation risk on activity and substrate choice of *Eurycea cirrigera* larvae.

Southern two-lined salamander, *Eurycea cirrigera*, is common in northwest Georgia and abundant in Flower Glen, a gravel/cobble fishless spring-fed creek in Marshall Forest, a Nature Conservancy preserve located in Rome, Floyd Co., GA. Flower Glen is fishless, but adult dusky salamanders, *Desmognathus fuscus*, are syntopic with and are potential predators of *E. cirrigera* larvae. We used a laboratory experiment to examine the effects of predation risk by adult *D. fuscus* on the activity pattern and substrate choice of *E. cirrigera* larvae. Larvae were presented with a choice of gravel and cobble substrate both in the presence or absence of adult *D. fuscus*. Predators were separated from larvae with Plexiglas positioned above the substrata and a grid drawn on the Plexiglas was used to examine larval activity.

- P31 ELLIOTT, JOHNATHAN, JANEAN WINTERS AND JEFFREY P. DUGUAY. Delta State University—Habitat use by marbled salamanders at Dahomey National Wildlife Refuge.

Declines of amphibian populations have been documented throughout the new world due to various causes, with habitat destruction being of primary importance. In order to properly manage for any species an understanding of its habitat requirements is essential. Beginning in September 2004, areas of Dahomey NWR, located in west-central Bolivar County, Mississippi, were searched for marbled salamanders (*Ambystoma opacum*). Once a salamander was located, micro-habitat variables were measured at each capture site and a corresponding random site located between 10m and 30m from each capture site. A multivariate analysis of variance was used to examine preliminary data from 12 salamander capture and random sites. Habitat variables differed between capture and random sites ($F_{11,7} = 11.76$, $P = 0.0067$), with salamanders occupying sites with a greater number of decaying logs, greater number of total logs, greater percent log cover, and areas with a greater basal area than random sites. Habitat management recommendations for the marbled salamander will be discussed.

- P32 STEWART, KELLEY R.¹, S. DOUG KAYLOR¹, MARK K. WATSON² AND THOMAS K. PAULEY¹, Marshall University¹ and University of Charleston²—The effects of pesticides Gypcheck and Btk on Plethodontidae salamanders.

Plethodontidae (lungless) salamanders are a diverse amphibian group in the state of WV. They are an important part of the food chain because they eat insects and then, in turn, are eaten by larger predators. They have very permeable skin and are more susceptible to environmental change than other groups of animals. The eggs are also unprotected (having no hard shell), which makes them susceptible to changes in the environment as an embryo and as growing larvae. One way a salamander's environment can be changed is by the addition of chemicals into its environment. This study examines the effects of two pesticides, Gypcheck and *Btk*, on forest salamanders in two ways. First, through the capture and recapture method using different techniques for aquatic and terrestrial salamanders we show that Plethodontid salamanders are not directly affected by these two chemicals in a terrestrial or aquatic environment. The only negatively significant population change occurred in the control sites and may have been due to fluctuations in environmental conditions. Secondly, upon examining the gut contents for presence or absence of food items, the greatest difference was 2% between plots treated with *Btk* and Gypcheck. It could be possible that these chemicals may greatly reduce insect populations in areas where it is used. The diet of salamanders affects fat reserves, which impact follicular development. This could significantly reduce the number of eggs and impact salamander populations. Further studies are needed to investigate the effects of these chemical on salamanders of this genus and others.

P33 HESTER, JOY M., STEVEN J. PRICE AND MICHAEL E. DORCAS. Davidson College—Effects of relocation on movements and home ranges of eastern box turtles (*Terrapene carolina*).

Eastern box turtle (*Terrapene carolina*) populations are threatened by expanding urbanization, the resulting loss of habitat, and the introduction of threats such as roads, railroads, and pets. Individual box turtles are often captured by humans and relocated substantial distances from their capture location. Additionally, relocating populations of box turtles to a less threatening environment has been suggested as a possible conservation strategy. However, previous studies examining the effects of relocation on box turtles are limited. Thus, we used radio-telemetry to compare the home ranges and movement patterns of resident and relocated box turtles. We tracked ten relocated and ten resident female box turtles on the Davidson College Ecological Preserve, in Davidson, NC, twice weekly beginning in May 2004. Geographic coordinates were recorded during each tracking session. Results suggest that the majority of relocated box turtles have larger home ranges and move longer distances than resident box turtles. Additionally, relocated turtles had higher mortality and disappearance rates than resident turtles. Our preliminary results indicate that relocated box turtles do not quickly reestablish home ranges in a new habitat, and may attempt to leave their relocation site, thus, raising questions about the success of relocation as a conservation strategy for eastern box turtles.

P34 SARAH A. BUDISCHAK, JOY M. HESTER, MICHAEL E. DORCAS AND STEVEN J. PRICE. Davidson College—The natural history of box turtles (*Terrapene carolina*) in an urbanized landscape.

Globally, many turtle species are experiencing population declines due to anthropogenic causes. Eastern box turtles (*Terrapene carolina*) are important components of the biota of eastern forests and in developing areas. Therefore studies are needed to estimate the effects of urbanization and to develop proper conservation strategies for these animals. In 1999 we initiated a long-term mark-recapture study of eastern box turtles in the vicinity of Davidson College, Davidson, NC. We used data from this study to describe the natural history characteristics of this box turtle population and to examine potential effects of urbanization. Specifically, we examined meristic characteristics, turtle condition, activity patterns, population structure, and growth rates in conjunction with the amount of

anthropogenically modified habitat within 100 m of each turtle's collection location. Males and females exhibited different, seasonal patterns of activity, measured by collection dates, and body condition, measured using the residual of a mass/carapace length ratio. Growth rates decreased with turtle age and varied between developed and forested habitats. Growth ceased at approximately 15 yrs. Proportionally, the oldest turtles were found in areas with extensive forest cover, as opposed to highly developed areas. Condition did not vary by amount of forest cover for males or females. Studies such as this one, which describe basic natural history characteristics and how those characteristics are affected by urbanization, form the first critical step in developing sound conservation strategies for box turtles in the eastern United States.

- P35 KORNILEV, YURII V., STEVEN J. PRICE AND MICHAEL E. DORCAS. Davidson College—Responses of eastern box turtles (*Terrapene carolina*) when trapped between railroad tracks.

Anecdotal accounts of eastern box turtles (*Terrapene carolina*) found dead between railroad tracks suggest that their populations might be negatively impacted by such structures. To investigate the potential impacts of railroads on box turtles, we recorded the number of climbing attempts, the distance moved, the overall speed of travel, and the exit behavior of 12 adult animals experimentally trapped for 1 hr between railroad tracks. Additionally, we examined the temperatures box turtles experience between rails. Only one individual escaped by climbing over a rail. The total distance moved by the majority of tested turtles was less than 100 m during the observation period. When presented with the option to leave at a railroad crossing, 3 turtles stayed between the tracks, 4 exited and headed towards an adjacent parallel road with moderate traffic, and 5 headed in the opposite direction towards a vegetated field. The mean distance between railroad crossings in our study area is 379 m; more than 50% of the crossings are separated by more than 200 m. Thus, at least two hours would be necessary for a box turtle consistently moving in its original direction to get from one railroad crossing to another. However, on a mild day (air temperature = 24 C) the core body temperatures of turtles trapped on railroads may reach lethal temperatures within this time. Railroads, like other human transportation infrastructures, likely serve not only as sources of direct mortality, but as barriers to turtle dispersal, leading to population declines and fragmentation.

- P36 KORNILEV, YURII V., MUR MUCHANE AND MICHAEL E. DORCAS. Davidson College—Online identification system for North Carolina snakes: a novel approach to an old problem.

Many conservation projects require the ability to accurately identify local flora and fauna (e.g., trees, frogs, flowers). Additionally, the non-scientific community is also interested in the proper recognition of various species they observe. Unfortunately, lengthy and expensive training is often required before identification skills can be considered reliable. Standard field guides and dichotomous keys, the traditional methods utilized for identifying species of animals and plants, usually necessitate knowledge of characters and terms that are difficult to ascertain correctly without extensive prior experience and equipment. Often, difficult or hazardous capture and handling of the specimens are also needed for comparing characteristics. We have developed a web-based system that addresses these problems and uses "Active Server Pages" (ASP) to query a database we compiled of characteristics describing the location, behavior, and morphology of the 37 species of snakes found throughout North Carolina. The user needs only to enter the information that they are certain about and the output lists all species that match the input criteria. Output includes images and information to help narrow down the choices. The output is also linked to the Amphibians and Reptiles of North Carolina webpage (<http://www.herpsfnc.org/>), which describes the selected species in more detail and assists in final identification.

- P37 COBAIN, ERIN F., WILLIAM C. HAAS AND MICHAEL, E. DORCAS. Davidson College—An investigation of physiological and behavioral thermoregulation during heating and cooling in *Charina bottae*.

Temperature variation has important functional consequences for snakes. Thus, thermoregulation is central to survival. Large reptiles are capable of increasing heating rates and reducing cooling rates using both physiological mechanisms (i.e. controlling blood flow) and behavioral mechanisms (i.e. altering their surface area to volume ratio). The ability to alter heating and cooling rates has rarely been examined in small reptiles. We investigated the ability of rubber boas (*Charina bottae*), a relatively small snake, to physiologically and behaviorally adjust rates of heating and cooling. In this investigation, temperature sensitive PIT tags were implanted into the bodies of ten captive rubber boas. The snakes were then subjected randomly to four heating and cooling treatments over a 5-33°C temperature range: 1) heating in a constrained position (i.e. held straight), 2) cooling in a constrained position, 3) heating in an unconstrained position and 4) cooling in an unconstrained position. The thermal time constant, the time required to reach 63% of its final temperature, was calculated for each snake in all treatments. Preliminary results have yielded three general conclusions: 1) larger snakes had greater thermal time constants than smaller snakes in all treatments, 2) rubber boas generally heated faster than they cooled and 3) rubber boas that were constrained had a faster rate of temperature change for both heating and cooling treatments than unconstrained rubber boas. Our results suggest that some small reptiles may possess both physiological and behavioral mechanisms by which they can alter rates of heating and cooling.

- P38 SANDERS, CLAY C., TERRY D. SCHWANER AND IRENE KOKKALA. North Georgia College and State University—Relationships between size and age in tigersnakes (Elapidae: *Notechis ater*) estimated from mark-release-recapture studies and skeletochronology.

Age and size are important factors in the demography of snake populations because critical life history traits (e.g., maturity, fecundity, and survivorship) may vary according to individual age or size. In populations with different mean and maximum body sizes, like tigersnakes on offshore islands of southern Australia, body size at maturity may be ecophenotypic (i.e., plastic) or adaptive. If the latter, size at maturity may be due to differences in growth rate (neoteny vs. acceleration) or differences in the offset timing of maturity (progenesis vs. hypermorphosis). To distinguish between non-adaptive and adaptive hypotheses there is no substitute for rearing captive neonatal snakes from different islands under standard feeding regimes. However, in the absence of such definitive tests, skeletochronology may be useful to distinguish different forms of heterochrony in populations with extreme body sizes. Mandibles from museum specimens or skeletal remains collected in the field were sectioned for tigersnakes of known body sizes from Roxby Island (smallest average body sizes) in the Sir Joseph Banks Group of Spencer Gulf, South Australia and Mt. Chappell Island in Bass Strait, Tasmania (largest average body sizes). The estimates of age from growth layers of bone we fitted to age size curves based on mark-release-recapture of snakes on Mt. Chappell Island. Snakes of the same size appeared to be the same age, suggesting that offset timing, not differences in growth rate explains body size differences between these island populations.

- P39 HILL, E. PIERSON, WILLIAM J. JOHNSON AND MICHAEL E. DORCAS. Davidson College—Habitat selection in black ratsnakes (*Elaphe obsoleta obsoleta*) in the western Piedmont of North Carolina.

Habitat fragmentation is a well-documented cause for species decline and extinction, especially in reptiles. However, some species may benefit from moderate anthropogenic

disturbances to habitats that create high edge to interior ratios. The black ratsnake (*Elaphe obsoleta obsoleta*) is well known in the Piedmont of North Carolina for its continued occurrence in areas of human development as well as its traditional forest habitats. To examine how ratsnakes use macrohabitats in a fragmented landscape, we radiotracked 14 black ratsnakes over a three-year period on the Davidson College Ecological Preserve in Mecklenburg County, NC. Snakes were found to use kudzu patches more than expected by their availability and avoided planted pine forests ($p < 0.001$). There was considerable inter-individual difference among snakes in their preferred habitats with some individuals selecting for habitat types that others avoided. All snakes had a strong preference for edge habitats, defined at 10-m and 20-m distance intervals ($p < 0.001$). Overall, moderate fragmentation due to anthropogenic modification of the landscape appears to result in habitats favored by black ratsnakes.

- P40 JOHNSON, WILLIAM J., E. PIERSON HILL AND MICHAEL E. DORCAS. Davidson College—Home range size and site fidelity of black rat snakes (*Elaphe obsoleta*) in the western Piedmont of North Carolina.

Understanding an animal's spatial ecology is a necessary component of conservation, particularly where urban development alters habitat. Many species show repeated use of specific locales within their environment and could be imperiled if those frequented areas are disturbed, forcing the animal to move elsewhere. We examined the spatial ecology of the black rat snake (*Elaphe obsoleta*) by radiotracking 13 snakes over a three-year period on the Davidson College Ecological Preserve in Mecklenburg County, NC. Snakes had an average active-season home-range size of 11.7 ± 4.3 ha. (measured as 95% kernel). Many of our snakes showed frequent use of particular areas within the environment over the duration of the study; in fact, 30% of total used area was common to multiple yearly home ranges. In general, females had larger home ranges and had higher site fidelity than males. Our study shows that black rat snakes do have discrete home ranges and exhibit substantial site fidelity. Understanding these traits is of tremendous importance for conservation because even the most commonly found species will be severely threatened if the areas in which it lives are targeted for human development.

- P41 HAYES, DAVID M., JOHN D. WHITE, JEFF A. BROOKS AND RUSSELL L. MINTON. University of Louisiana at Monroe—Distribution and diversity of freshwater gastropods in Bayou Bartholomew, Arkansas.

Pulmonate and prosobranch gastropods play important roles in the ecology of many freshwater systems. Previous authors have predicted that pulmonates will dominate headwater systems while prosobranchs will be more common in larger order streams. This distribution hypothesis, tested in lotic systems of the southeastern U.S., is attributed to differences in dissolved oxygen, food sources and availability, dispersal rates, and predation pressures. We performed a survey of freshwater gastropods in Bayou Bartholomew, Arkansas, and tested the distribution hypothesis in a lotic system that exhibits both lentic and lotic qualities.

- P42 MINTON, RUSSELL L.¹ AND KATHRYN E. PEREZ². University of Louisiana at Monroe¹ and University of Alabama²—A systematic checklist of the land snails of Louisiana.

Reviews of literature and museum records indicate that 141 species of land snail occur in Louisiana. This represents an increase of 39 species from the most recently published works. Diversity by parish is presented, along with a discussion of record paucity for certain parishes and future survey plans.

- P43 LOUGHMAN, ZACHARY. Marshall University—Survey of crayfish (Decapoda: Cambaridae) species along the Ohio River floodplain in West Virginia.

Since the publication of Jezerinac's "Crayfishes of West Virginia" in 1995, few scientific investigations involving crayfish distributions across West Virginia have been performed. In particular, crayfish biodiversity along the Ohio River floodplain in West Virginia has received no research interests since this publication. Crayfish surveys were conducted along the Ohio River floodplain beginning in Mason County and ending in Marshall County in the spring of 2004. Minnow traps were placed in 11 sites along the floodplain starting 15 January, 2004 and ending 15 April, 2004, for 5005 trap nights. Traps were checked once every 7 days during the duration of the study. Data collected at each site included crayfish species, sex, carapace length and palm length. Results indicated that *Cambarus (T.) thomai* is the most widespread species along the floodplain, occurring in 9 of 11 sites. A site in Mason County yielded a new population of *Fallicambarus (C.) fodiens* and a new species for the state, *Procambarus (O.) acutus*. Two invasive crayfish species, *Orconectes (G.) virrilis* and *Orconectes (P.) rusticus*, were discovered in 4 new locations. Diversity was positively correlated with sites having closed canopies, herbaceous buffer zones and isolation from the Ohio River mainstem. Low diversity sites lacked these three parameters and were associated with industrial plants. Three of the 4 new invasive species locations were connected to the Ohio River mainstem. This may indicate that the Ohio River is a major corridor for *O. rusticus* and *O. virilis* introductions throughout the state.

- P44 TOWNSEND, VICTOR R. JR¹ AND CARY A. GUFFEY². Virginia Wesleyan College¹ and Our Lady of the Lake University²—Sexual and seasonal variation in parasitism by erythraeid mites (*Leptus*) on three species of harvestmen (*Leiobunum*).

Larval erythraeid mites are common ectoparasites of terrestrial arthropods including millipedes, insects, and arachnids. For harvestmen, the mode and location of attachment of larval mites of the genus *Leptus* have been studied. However, relatively little is known about interspecific, intersexual, or seasonal variation in infestation rates. In this study, we examined parasitism by larval *Leptus* upon males and females of three species of harvestmen, *Leiobunum formosum*, *L. nigripes*, and *L. vitattum*. Our results indicate that infestation rates vary considerably between species. In a southeastern Virginia population of *L. formosum*, infestation rates did not differ significantly between sexes, however they did vary between years from 3.3% (2004) to 15.3% (2003). In a southern Louisiana population of *L. nigripes*, males were significantly more heavily parasitized than females, with an overall infestation rate of 56%. In *L. vitattum* (also from southern Louisiana), infestation rates did not exhibit intersexual variation and the overall rate was 11%. The mean number of mites also varied significantly between species, ranging from 1 mite/individual (*L. formosum*) to 4 mites/individual (*L. nigripes*). The biological significance of interspecific differences in the rates of mite parasitism and the effects of heavy mite loads upon an individual harvestman requires further study. We hypothesize that interspecific and intersexual differences in mite parasitism rates may reflect variation in habitat use.

- P45 PROUD, DANIEL N., JENNIFER O. BRADFORD, KIMBERLY A. MULHOLLAND, DANIEL S. MARGOLIES AND VICTOR R. TOWNSEND, JR. Virginia Wesleyan College—Seasonal use of beehives by *Leiobunum formosum* (Opiliones, Sclerosomatidae).

Most species of harvestmen display considerable seasonal and temporal variation with regards to their behavioral ecology. During Summer, juveniles and adults are nocturnal, solitary, and actively feed. In Autumn, courtship occurs and dense aggregations consisting

of dozens, hundreds, or thousands of adults have been observed. In most species, individuals overwinter either as eggs or juveniles. In comparison, *Leiobunum formosum* is unusual because mature adults overwinter and survive through Spring. Over the past two years, we have studied the ecology of this species and its association with commercial beehives on the campus of Virginia Wesleyan College. Hives were sampled in the afternoon and evening from September-November of 2003 and 2004. Adult harvestmen were captured, marked with model paint, and released. Data including temperature, location of the capture on the hive, number of legs, number of mites (if present), and sex were recorded. In addition, observations of courtship and feeding were made. Our results indicate that individuals are more active and occur at greater numbers on the hives after dark. We have also found significantly more harvestmen on occupied beehives than on empty hive bodies. In addition, we have observed a significantly greater number of harvestmen on the hives than on nearby pine trees or hardwoods. Our results also have revealed that local population of harvestmen is highly transient. Individuals frequently move from hive to hive and most tend to occupy the beehives for relatively short period of time, 24 hours (commonly) to 2 weeks (rarely).

- P46 WILTSHIRE, VITILLIA¹, MICHAEL J. RUBBO² AND VICTOR R. TOWNSEND, JR.¹ Virginia Wesleyan College¹ and Virginia Polytechnic Institute²—Variation in tree usage by juvenile and adult *Leiobunum formosum* (Opiliones, Sclerosomatidae) in southeastern Virginia.

Leiobunum formosum is a common harvestman in southeastern Virginia. On the campus of Virginia Wesleyan College, it is the most abundant opilionid species and occurs in variety of habitats including forests and anthropomorphic structures. The life history of *L. formosum* is unusual in comparison to other species of harvestmen in that individuals overwinter as adults. Relatively little is known about the ecology of this species. From June 9-June 17 2004, we undertook a survey of the distribution of *L. formosum* in two types of habitats, a monotypic stand of planted pine trees (*Pinus*) and a mesic, mixed hardwood forest, dominated in patches by *Quercus*, *Acer*, *Fagus*, *Carya*, and *Cornus*. For each forest type, we sampled a total of 60 trees during the morning, afternoon, and evening. Our results indicate that juveniles and adults use these forested habitats differently. We found that significantly more adults and juveniles were collected from the pine forest. For adults, we also discovered a significant, positive correlation between number of individuals and the diameter at breast height (DBH) for pine trees. This correlation, however, was not significant for hardwoods. For juveniles, we found a significant positive correlation for DBH in deciduous trees, but not pine trees. In addition, the number of harvestmen that we collected did not differ between the different times of day for the deciduous forest. However, in the pine forest, significantly more adults and juveniles were captured during the evening (after dusk) than during either morning or afternoon samples.

- P47 SARACINA, CHRISTINA L. AND C. BRIAN ODOM. Wingate University—Prevalence of two social forms of the red imported fire ant, *Solenopsis invicta*, (Buren), in Union County, North Carolina.

The Red Imported Fire Ant, *Solenopsis invicta* (Buren), exists in two distinct social forms monogyny and polygyny. Monogyne colonies possess a single, fertile queen, while polygyne mounds contain multiple fertile queens. A single genetic locus has been identified and shown to be responsible for these two social forms. Diagnostic polymerase chain reaction (PCR) specific for the social allele was used to examine colonies from Union County, NC, in order to determine the prevalence of each social form.

- P48 SUDBRINK, DONALD L. AND STEVEN HUGHES. Delta State University—Tri-trophic goldenrod-gall insect communities in the Mississippi Delta: influence of landscape.

Goldenrod (*Solidago* spp.) and gall insect communities are widely dispersed in the Yazoo-Mississippi Delta region because much of the area is dominated by row crop agriculture. In 2004, investigation of these communities was conducted at several locations in the Mississippi Delta including the Dahomey National Wildlife Refuge. Three main types of insects produced galls on goldenrod: round-gall flies, *Eurosta solidaginis*, (Diptera: Tephritidae), leafy rosette gall flies *Rhopalomyia solidaginis* (Diptera: Cecidomyiidae), and elliptical gall moths. The most commonly encountered gall former was *E. solidaginis*. Larvae of this gall former were preyed upon by several species of insects and vertebrates including wasp larvae, *Eurytoma* spp. (Hymenoptera: Eurytomidae), inquiline flower beetle larvae, *Mordellistena* spp. (Coleoptera: Mordellidae), and downy woodpeckers. Preliminary data indicate that population levels of *Eurosta* spp. were higher strip patches of goldenrod growing near woods edges vs. those in open fields. Levels of predation of *Eurosta* spp. and predator species varied among locations.

- P49 KIRKER G. T., S. V. DIEHL AND M. L. PREWITT. Mississippi State University—Effects of Chlorothalonil (CTN) and Butylated Hydroxy Toluene (BHT) on microbial communities involved in deterioration of wood using T-RFLP.

The effects of Chlorothalonil (CTN) and Butylated Hydroxy Toluene (BHT) on microbial species diversity in wood and the surrounding soil are being assessed by Terminal Restriction Fragment Length Polymorphism (T-RFLP). The initial results of a field study and accelerated lab study will be presented. Resultant data will be used to correlate community shifts of microorganisms with biocide breakdown and wood failure. The experimental design is a split plot with southern yellow pine stakes treated with 0.3% and 0.1% rates of CTN, 2.0% BHT, 0.3% CTN + 2.0% BHT, and untreated controls in two different soil types. Samples are taken monthly over a two- year period. Genomic DNA is extracted from these stakes for both fungi and bacteria. Extracted DNA is amplified for T-RFLP analysis using a general fungi ITS primer set, a basidiomycete specific ITS primer set, and a 16S rDNA bacteria primer set. Terminal fragments will be analyzed by a Beckman-Coulter capillary sequencer. The terminal restriction fragment (T-RF) can potentially identify specific organisms in the community based on their (T-RF) length. The goal is to use t-RFLP to follow microbial community patterns during colonization of wood treated with different wood preservatives and to correlate community shifts with biocide breakdown and wood decay. Characterization of these pattern shifts will provide a better understanding of the biology and ecology of wood decay microorganisms as well as the effects of biocides on the microbial community in treated wood and in the soil.

- P50 CLAXTON, JESSICA L. AND ANNA R. OLLER. Central Missouri State University—Antibiotic resistance determination of oral microbes.

Antibiotic resistance has become a prominent concern in the medical industry as microbes continue to acquire genetic material to make them resistant to currently available drugs. Determination of antibiotic resistance of pathogenic microbes in patients is essential for proper treatment. Antibiotic resistance is thought to increase with age due to increased antibiotic usage and hormonal changes. Oral pathogens like *Prevotella* species have been shown to be highly associated with atherosclerosis and stroke, as well as pneumonia, pre-term labor, and systemic diseases. This study tested antibiotic resistance of oral microbes cultured from extracted teeth over three age groups (18-39, 40-69, 70-99). Extracted teeth were submerged in broth tubes and a diverse microbial population was cultured. Isolates were selected for additional testing based on preliminary tests such as gram stains and biooxidation tests. Each isolate (six from each of twenty-seven teeth) was subjected to

antibiotic susceptibility testing using the Kirby-Bauer method. The antibiotics ampicillin, bacitracin, cefoperazone, erythromycin, kanamycin, and vancomycin were selected based upon frequency of use and mode of action on cells. Results will be compared over age groups. Our research will allow for the development of new treatment plans for people at high risk for systemic diseases. This research was supported by a Central Missouri State University Willard North Graduate Student Award.

- P51 BOLDEN, ADRIENNE¹, L. FREDERICK¹, R. MICHELIN², W. LENA AUSTIN² AND A. L. WILLIAMS². Howard University¹ and Morgan State University²—Further studies on the antifungal effects of a dark-pigmented strain of *Bacillus mojavensis*.

Additional studies have been conducted on the effect antifungal substances, of a dark-pigmented strain of *Bacillus*, now identified as *B. mojavensis*, have on inhibiting the growth of species of filamentous fungi and a yeast. The bacteria have been challenged on potato-dextrose agar (PDA) and nutrient agar (NA) under ambient room light and temperature as well as under controlled light and temperature conditions. There have been no significant differences, in the results under these different cultural conditions. Significant differences have been obtained when challenges on the two culture media have been compared. PDA plates have provided the best results since all fungi tested grew well on this medium but poorly on NA. Growth of *B. mojavensis* was equally as good on PDA as on NA except the dark pigment was minimal on NA. Out of the 18 fungi tested in these experiments, growth of 15 was strongly inhibited after more than two weeks, one of the 15 was inhibited initially but gradually invaded the inhibition zone after two weeks, and the antifungal properties appeared to have no effect on the growth of 3 of the filamentous species. The fungi tested were *Alternaria solani*, *Aposphaeria* sp., *Aspergillus fumigatus*, *Botrytis cinerea*, *Candida* sp., *Chaetomium* sp., *Colletotrichum* sp., *Entomophthora coronata*, *Fusarium* sp., *Paecilomyces* sp., *Penicillium* sp., *Periconia* sp., *Sordaria fimicola*, *Syncephalastrum* sp., *Trichoderma* sp., *Zygorhynchus* sp., and two unidentified filamentous fungi designated MSC 39 and MSC 40. Growth of *A. fumigatus*, the species of *Penicillium* tested, and the MSC 39 culture was not inhibited.

- P52 POWELL, MARTHA J., WILL H. BLACKWELL, PETER M. LETCHER AND PERRY CHURCHILL. The University of Alabama—Species richness of chytrid fungi in benthic and metaphyton assemblages.

An environmental role for chytrid fungi (Chytridiomycota) in aquatic communities is under recognized. This study describes microscopic and molecular methods for determining species richness of chytrids. The presence of chytrids in benthic and metaphyton assemblages, especially biofilms, is compared. Results show that a few chytrid species are common, whereas others are uncommon or rare. Most importantly, chytrids as a group are ubiquitous and can be locally abundant in these habitats. Consequently, their impact on productivity needs to be considered further in ecological studies.

- P53 ROBERTS, ANDREW AND GREIPSSON, SIGURDUR. Troy University—Arbuscular mycorrhizal fungi (AMF) infection potential and spore numbers in soil of ecozones across coastal sand dune ecosystem on Dauphin Island, Alabama.

Dauphin Island, Alabama is a barrier island in the Gulf of Mexico that has experienced severe beach erosion over the past century. Four ecozones were established across the coastal dune ecosystem of Dauphin Island: shore, foredune, maindune, and backdune. The Mycorrhizal Infectivity Potential (MIP) of the dune soil in all ecozones was determined using corn (*Zea mays* L.) as bait plant in diluted (1:1) soil sand system. Bait plants were grown in growth-chamber for one month. Roots of bait plants were stained using Trypan blue and total AMF colonization was estimated. Spore densities of the dune soil in each

ecozone were determined using a modified version of the decanting and wet sieving technique. The MIP test did not reveal any significant differences among ecozones with the exception of significantly lowest percentages of arbuscular root colonization in the backdunes. Numbers of spores were significantly highest in the maindunes and lowest in the foredunes. Unusually high numbers of spores were found in the shore samples. The unusually high values of MIP, and spore densities of shore plants could be due to sea erosion; the shore was recently a foredune and high number of AMF propagules probably still exists in the shore sand. Information about AMF would benefit the development of ecologically sound restoration techniques for coastal sand dunes.

P54 OLLER, ANNA R. Central Missouri State University—Fungal polysaccharides visualized via modified staining.

Staining techniques have been widely utilized for centuries to visualize organismal cellular components and compounds. Many stains have been developed to enhance recognition of specific organelles and compounds. Most microbial stains do not penetrate many cellular components concurrently, thus hindering potential understanding of regulatory mechanisms. Certain bacteria and fungi produce exopolysaccharides, which must be visualized to determine physiological responses to nutrients, such as various sugars and amino acids. All of the individual stains utilized have been previously characterized. Alcian blue stains general polysaccharides in tissues, carbol fuchsin adheres to DNA and cell walls, and sudan black B binds to lipids. Individually these stains are insufficient to see the overall cell components. In order to visualize melanin and polysaccharides, the three stains were employed in a unique manner. The combination of sudan black B, alcian blue, and carbol fuchsin enabled contrasting visualization of polysaccharides, melanin, cell walls, DNA, and mechanisms like mitosis (spindles and chromosomal DNA). This staining combination proved successful on several bacterial and fungal strains grown both on agar and in broth suspensions. Examples showing various cellular components will be shown and discussed.

P55 LANDRY, DAWN L. AND STEPHEN C. LANDERS. Troy University—Protists from Lake Lagoona on the Troy University Campus.

Lake Lagoona is the largest body of freshwater on the Troy University Campus. Though used for classroom work, an inventory of the protists in the lake has not been made. This research project cataloged protists from Lake Lagoona through a variety of collection methods, including plankton tows and glass slide traps. The organisms were identified, measured, and photographed. Numerous genera of protists were collected in the Fall, as follows: *Carchesium*, *Codonella*, *Epistylis*, *Euplotes*, *Stentor*, *Vorticella* (ciliates); *Ceratium*, *Dinobryon*, *Euglena*, *Mallomonas*, *Phacus*, *Synura*, *Trachelomonas* (flagellates); *Diffugia* (amoebae); *Desmidium*, *Errerella*, *Micrasterias*, *Pediastrum*, *Scenedesmus*, *Spirogyra*, *Staurostrum*, *Tetraedron*, (Chlorophytes). Additionally, many metazoans were recovered in our plankton net, including *Conochilus*, *Keratella*, and *Polyarthra* (Rotifera). Additional collections in the winter and spring will greatly increase our inventory.

P56 BOOPATHY, RAJ AND EARL MELANCON. Nicholls State University—Effect of the Davis Pond diversion project on water quality in the wetlands of Barataria Bay.

Louisiana is losing coastal wetlands at the rate of 25 to 35 square miles per year, the highest rate in North America. There is an urgent national need to address this national issue. One method of addressing the coastal land loss is through the Federal-State sponsored action of diverting Mississippi river freshwater and sediments into the estuaries. This will help to reduce high salinities from moving inland from the Gulf of

Mexico and stressing freshwater wetlands, while also helping to reduce natural and human-induced marsh soil subsidence. Such a freshwater diversion has been constructed at the head of the Barataria basin at Davis Pond and it is operational since July of 2002. The operation of Davis Pond is expected to save an estimated 33,000 acres of marsh from coastal land loss in the next 50 years. The change brought about the freshwater diversion will affect the aquatic ecosystem in many ways from micro-flora to invertebrate and vertebrate organisms. We studied the diversity of microbial communities at five different locations in the wetland. We observed a shift in microbial populations especially enteric bacteria as the salinity level changed gradually. We will report total monthly microbial counts in study sites along with variation in microbial communities and population dynamics.

- P57 KELLER, HAROLD W.¹, H. THORSTEN LUMBSCH², ERIN R. FANNING¹, STEVEN B. SELVA³ AND JOSEPH S. ELY¹. Central Missouri State University¹, The Field Museum, Chicago, Illinois² and University of Maine at Fort Kent³—First Lichen Bio-Quest in Great Smoky Mountains National Park.

This first Lichen Bio-Quest was held at Great Smoky Mountains Institute at Tremont near Townsend, Tennessee on June 19 and 20, 2004. Over 30 participants registered, including high school, college, and university teachers and students, park volunteers and staff, area residents interested in learning more about life forms in the Park, and amateur and professional lichenologists. Two lichenologists served as experts for identification and as foray captains. H. Thorsten Lumbsch, Ph.D., presented a lecture that covered lichen symbiosis, morphology (growth forms and terminology), reproduction, physiology, ecology, importance, lichen systematics, and taxonomic characters. Professor Steven B. Selva, Ph.D., gave a lecture on the use of calicioid lichens (stubble lichens) as environmental indicators of old growth forests and morphological characters to distinguish this group of lichens. Stalked apothecia of stubble lichens appear similar in gross morphology to stalked myxomycete species in the genus *Licea*. Lower elevation collection sites (Lumber Ridge Trail and Glade Falls, 405 meters), were located in the Tremont area; higher elevation sites included Spruce Fir Nature Trail, Lower Beech Gap Trail, and Balsam Mountain Road, and ranged from 1,094 to 1,680 meters. Results of a short afternoon and full day forays were: total number of different species identified=88; new park records=5: (*Phaeocalicium polyporaeum*, *Mycocalicium subtile*, *Calicium glaucellum*, *Chaenotheca brunneola*, *Placynthiella icmalea*). Funded in part by the National Science Foundation DEB Award #0343447, Discover Life in America Award #2004-6, National Geographic Society Committee for Research and Exploration Award #7272-02 to HWK and Sigma Xi Grant-in-Aid of Research Award #3040094 to ERF.

- P58 LUMBSCH, H. THORSTEN¹, ERIN R. FANNING², JOSEPH S. ELY² AND HAROLD W. KELLER². The Field Museum, Chicago, Illinois¹ and Central Missouri State University²—New additions to the lichen biota of Great Smoky Mountains National Park.

Tree canopy surveys for lichen biodiversity in Great Smoky Mountains National Park during the summer of 2000 resulted in 84 new lichen records. Nine additional new records were collected during June of 2004. The double rope climbing method was used in this first study to sample lichens from the tree canopy. Three newly recorded lichen species growing on siliceous rocks included *Aspicilia caesiocinerea*, *Trapelia involuta*, and *Trapelia placodioides*. They were found on the southwest facing slopes or glades dominated by *Pinus virginiana*, *Rhus copallina*, *Danthonia* spp, and *Schizachyrium scoparium*, near Great Smoky Mountain Institute at Tremont. Four new park records of corticolous lichen species were found on hardwood trees. *Gyalecta flotowii* was found at a height of ca 20 m on *Fraxinus americana* while *Lecanora casuarinophila* and *Gomphillus americanus* both were found on *Liquidambar styraciflua* at a height of ca 17 m. *Pyrenula*

pseudobufonia was growing at the base of *Carpinus caroliniana*. *Placynthiella icmalea* and *Trapeliopsis flexuosa* were collected from a weathered, wooden picnic table. All tree canopy lichen species are also known to occur on ground sites. The importance of the Park as a glacial refugium for widely disjunct species is demonstrated by lichen species that occur in eastern North America, the Pontis region, and those occurring in eastern Asia. Funded in part by the National Science Foundation DEB Award #0343447, Discover Life in America Award #2004-6, National Geographic Society Committee for Research and Exploration Award #7272-02 to HWK, and Sigma Xi Grant-in-Aid of Research Award #3040094 to ERF.

P59 GREIPSSON, SIGURDUR. Troy University—Effects of EDTA and fungicide (benomyl) application on lead uptake and growth by corn (*Zea mays*).

Lead (Pb) contamination in soil is widespread due to airborne pollution. Lead contaminated soils usually contain high Pb concentration in surface layers. Phytoextraction uses plants to remediate metal polluted soils. Arbuscular mycorrhizal fungi (AMF) play an important role in the exclusion of Pb by plant roots. AMF activity can be inhibited by using a fungicide (benomyl). Supplementing soil with synthetic chelating agents such as EDTA can increase bioavailability of Pb in soil. Soil containing low concentrations of Pb (40 mg kg^{-1}) was collected from a hardwood forest of the Arboretum of Troy University, Troy, AL. Seed of corn were germinated and planted in pots containing the soil. Plants were subjected to the following treatments: (1) control, (2) benomyl (1 mg kg^{-1} soil) pretreated soil, (3) EDTA (1 mmol kg^{-1}) added twice (100 ml) and (4) EDTA and benomyl. AMF root colonization was estimated by staining roots with Trypan blue. No AMF root colonization was found; this is probably due to extremely low AMF infectivity of the soil used. Plants treated with EDTA and benomyl grew significantly better than control ones. This could be the result of curtailed activities of pathogenic soil fungi and increased nutrient availability by chelating effects of EDTA. Synergistic effects were obtained in Pb uptake by EDTA and benomyl applications.

P60 GIBSON, SANDY AND SIGURDUR GREIPSSON. Troy University—Effects of fungicide (benomyl) on phytoextraction by ryegrass of zinc contaminated soil.

Metal compounds in soil can be attributed to trace elements from bedrock or through anthropogenic practices such as smelting and industry. High concentrations of metals in soil can have toxic effects dependent upon bioavailability. Soil remediation techniques such as phytoextraction are a plausible solution in reversing toxic processes. Ryegrass (*Lolium perenne*) is commonly used in revegetation practices. In order to determine the effects of arbuscular mycorrhizal fungi (AMF) on metal accumulation of ryegrass, benomyl ($\text{C}_{14}\text{H}_{18}\text{N}_4\text{O}_3$) was incorporated into the soil, prior to seed germination. Benomyl was introduced by dissolving 20 mg kg^{-1} of soil. Plants were challenged with 7.5 ppm zinc (Zn). Plants were grown for two months in pots placed in the Troy University greenhouse. Plants were subjected to the following treatments: (1) control, (2) benomyl, (3) Zn, (4) benomyl & Zn. Benomyl application inhibited uptake of Zn. The significantly highest Zn concentrations in leaves and roots were found in plants treated with Zn. Concentration of Zn in leaves did not differ significantly between control plants and those treated with benomyl. Zinc was not detected in plants treated with benomyl & Zn. Similar trend was found for copper where concentrations in leaves were significantly highest in plants treated with Zn followed by control plants. Copper was not detected in roots. The results indicated that benomyl inhibited AMF mediated uptake of both Zn and Cu. These results could be beneficial in developing techniques of phytoextraction of Zn contaminated soils.

- P61 BOLIN, KRIS, ROBERT BURCHFIELD, ANDREA NIEDERKLOPFER, BILL SUMMERS AND T. WAYNE BARGER. Tennessee Technological University—A preliminary survey of the vascular flora of Burgess Falls State Natural Area, White County, Tennessee.

Burgess Falls State Natural Area is a 58 ha mixed mesophytic forest community located near the Cumberland Plateau, on the eastern edge of the Highland Rim approximately 10 miles north of Sparta (White County, TN). These moist broadleaf forests are bisected by the Falling Water River and contain an abundance of species, with 30 tree species found in the relatively small area. This study is being conducted to provide a vascular plant flora/checklist for the All Taxa Biodiversity Inventory currently underway at all Tennessee State Parks. The compiled lists will be useful in future park management practices and in the comparison of plant communities and distributions. Initial plant surveys have found, *Panax quinquefolius* L. (Ginseng), *Juglans cinerea* L. (Butternut), *Cladrastis kentukea* (Dum.-Cours.) Rudd (Yellowwood), and *Trillium grandiflorum* (Michx.) Salisb. (Large-flowered Trillium). This multi-year survey will be conducted over several growing seasons in an effort to compile the most complete vascular plant list of the park to date.

- P62 WYLES, JENNIFER M. AND KERRY D. HEAFNER. The University of Louisiana at Monroe—A phylogeographic and taxonomic assessment of *Isoetes butleri* Engelmann (Isoetaceae) in North America.

Isoetes butleri Engelmann was described in 1877 based on material collected in Atoka County, Oklahoma. This diploid quillwort is a member of the *Isoetes melanopoda* assemblage of North America, and has a range that is bisected by the Mississippi River. On the west side of the Mississippi, *I. butleri* ranges from Illinois southward through Missouri, Oklahoma, Kansas, Arkansas, and eastern Texas. On the east side of the Mississippi, *I. butleri* has a more narrow range occurring in the central basin region of Tennessee, in northern Alabama, and in one county in northwestern Georgia. Whereas other members of the *I. melanopoda* assemblage occupy acidic habitats (*i.e.*, clay soils, granitic outcrops), *I. butleri* occurs on basic substrates, usually limestone outcrops, with other calciphilic species. We are conducting a phylogeographic study of *I. butleri* in order to test for morphologic divergence among populations on eastern and western sides of the Mississippi River. Preliminary data have been derived from subula lengths and widths and ala lengths and widths from 20 randomly selected plants collected from 7 populations (3 from west of the Mississippi River and 4 from east of the Mississippi River) of *I. butleri*. No significant morphological differences exist among populations collected from both eastern and western sides of the Mississippi River based on purely vegetative characters. The second phase of this study will assess variation in the sporangial region of microphylls and mega- and microspore characters. Finally, genetic variation among populations will be assessed using ISSR data.

- P63 FARMER, SUSAN B. University of Tennessee—Trilliaceae versus Melanthiaceae: one family or two.

As part of studies concerning the evolutionary relationships within Trilliaceae, an analysis was made of the placement within Liliales. Much of the early molecular evidence placed Trilliaceae within Melanthiaceae, but morphology does not lend support to this placement. Based on phylogenetic analysis of the ITS region of nuclear DNA plus other newly published analyses of Liliales as well as morphology, a case is presented for a sister relationship between these two families.

- P64 BAGHAI-RIDING, NINA¹ AND CHARLES SWANN². Delta State University¹ and Mississippi Mineral Resources Institute/Center for Community Earthquake Preparedness²—Palynological results from Late Quaternary sediments from Union County, Mississippi.

There is a paucity of data regarding paleoclimates linked with Quaternary fluvial sediments associated with major river systems of the southeastern United States. Questions of primary importance in this study focus on changes in climate that occurred in northern Mississippi during the Late Quaternary. A mastodon pelvis was found *in situ* several years ago near the base of Jasper Creek, situated in the Myrtle Quadrangle, near New Albany, Union County, Mississippi. Waters from this creek flow into the Little Tallahatchie River approximately one-mile (2.2 km) south of the mastodon site. Two samples for palynological analysis were collected in October 2003 from the site. Twelve additional samples (taken at one-foot (30.5 cm) intervals) were collected from a 13-foot (4 m) stream exposure located approximately one-fourth of a mile (0.55 km) upstream from the mastodon site. Most of the samples contain abundant opaline, siliceous phytoliths of grasses and conifers that are characteristic of the last glacial period in North America that ended approximately 10,000 years ago. Many of the phytoliths contain dark brown to reddish orange organic inclusions. Recovered palynomorphs include assorted fungal fruiting bodies and hyphae, conifer pollen of *Pinus*, *Taxodium*, and *Tsuga*, and angiosperm pollen of *Ambrosia*, *Carya*, *Juglans*, *Sagittaria* and unidentified specimens of Gramineae (grasses). These phytoliths and palynomorphs are associated with midwestern prairie regions in the central United States, peripheral areas of the Atlantic Coast and the middle Great Lakes from the Late Quaternary.

- P65 STEVENS, ANDREW C. AND A. JOSEPH POLLARD. Furman University—Preliminary RAPD analysis of the systematics of *Packera (Senecio) plattensis* from the Buck Creek olivine deposit, North Carolina.

Packera plattensis (= *Senecio plattensis*) is primarily a plant of the prairies of central North America. A disjunct population has been reported from the Buck Creek olivine deposit, an ultramafic outcrop in the Nantahala National Forest of western North Carolina. This is the only known locality for *P. plattensis* in the Carolinas, and the plants are morphologically atypical for the species. We are beginning a study using molecular techniques to clarify the taxonomic position of these plants, which belong to a problematic genus in which hybridization is common. It is possible that the Buck Creek plants have been misidentified, or that they may have experienced genetic introgression from other *Packera* species, as has been proposed for *P. plattensis* in western Virginia. The present study, employed random amplification of polymorphic DNA (RAPD) in an attempt to identify diagnostic markers. We have identified primers that yield variable fragment lengths, and compared plants from the Buck Creek population to samples of *P. aurea*, which is also common in the area. Our results confirm the ability of RAPD to distinguish these taxa. Comparisons to *P. plattensis* collected in Oklahoma are currently under investigation. Future studies will include other related taxa with the goal of describing the phylogenetic relationships among southeastern *Packera* species.

- P66 JENNE, KEVIN AND ROBERT CARTER. Jacksonville State University—A dendrochronological study of relic longleaf pine (*Pinus palustris* P. Mill.) stands in Talladega National Forest, Alabama.

Patterns of forest disturbance over a 250-year period were detected through dendrochronological analysis of relict longleaf pine (*Pinus palustris* P. Mill.) stands on the Talladega National Forest in Alabama. Changes in growth patterns followed the occurrence of anthropogenic disturbances. The variance between mean growth in each stand also substantiates that climatic variables did not cause these growth changes.

Substantial growth changes parallel periods in history of exploitation of these ecosystems and occurred with the onset of settlement by Europeans in the early 1800's and once again in the early 1900's.

- P67 WOMACK, BRENT and ROBERT CARTER. Jacksonville State University—Forest community analysis of the Horseblock Mountain Region of the Talladega National Forest, Alabama.

Analysis of forested communities in the Horseblock Mountain Region of the Talladega National Forest, Alabama, using vegetation, soil, and landform data revealed an environmental gradient from longleaf pine dominated ridgetops to oak dominated riparian zones. Landscape scale analysis of ecosystems revealed five major ecosystems. The results can be used in developing ecosystem specific land management practices. The research is supported by a grant from the National Fish and Wildlife Foundation.

- P68 WHITNEY, BRANDON¹, ALEXA MCKERROW^{1,2} AND THOMAS WENTWORTH¹. ¹North Carolina State University and ²Southeast Gap Analysis Project—Mapping the cedar glades of the Tennessee Central Basin.

The cedar glades of the Central Basin of Tennessee represent one of the globally rare rock-outcrop communities in the Southeastern United States. These glades, which are mosaics of bare rock and cedar woodlands, support three federally endangered and over 25 state listed plant species. To determine the conservation status of the cedar glades, the Southeast Gap Analysis Project needs an accurate distribution map. The combination of small patch size, scattered distribution, and changes in land use around these communities make them difficult to map using satellite imagery alone. Often the bare rock looks similar to urban or other barren cover types, such as fallow fields. In this project, we will be using high resolution digital aerial photographs to identify cedar glades. We also have access to three dates of satellite imagery for the region, and we will use these images to separate fallow fields and urban land cover from the natural areas to be photo-interpreted. By overlaying a data layer for geology on the aerial photographs, along with location records for diagnostic plant species, we can construct a set of training sites for recognizing the pattern of glades in these photographs. Once the distribution map is complete and its accuracy assessed, we will intersect a data layer of conservation lands in the Central Basin to conduct a Gap Analysis for the cedar glades. This analysis will enable us to determine the percentage of this globally rare community that is currently protected.

- P69 LIVINGSTON, GRACE¹ AND KATHERINE ELLIOTT². Furman University¹ and Coweeta Hydrologic Laboratory²—Herbaceous layer species diversity and composition in the Ray Branch watershed, North Carolina.

In riparian communities, the vegetation is linked to ecosystem function and integrity. We wished to determine if forest harvesting in watersheds can affect riparian plant species abundance, species richness, and diversity. The objective of this study was to describe and compare herbaceous layer species composition and diversity of riparian communities preceding proposed forest harvest treatments in the southern Appalachian Mountains. Specifically, we measured the vegetation in four sub-watersheds of the Ray Branch watershed in western North Carolina. To sample vegetation, transects were established at each treatment site to inventory the herbaceous layer before (summers 2004, 2005) and after the cutting treatments (spring-summer 2006). The herbaceous layer included woody stems <0.5 m high and all herbaceous species. Ten 1.0 m² quadrats at 5 m intervals along each transect were sampled. In each of the quadrats, percent cover of ground flora species was estimated visually and recorded by species. Species diversity was evaluated using species richness, the Shannon-Wiener index of diversity, and Pielou's evenness index. Pair-wise tests revealed that species in common between sites ranged from 69% to

78%. Direct gradient analysis (canonical correspondence analysis) was used to explore the vegetation-site relationships between herbaceous layer abundance (percent cover) and environmental variables (soil moisture, light, and distance from stream). According to these analyses, the four sites did not differ significantly. The similarity of riparian vegetation in these sub-watersheds should enhance our ability to detect watershed-wide changes following forest harvest.

- P70 BOYER, TERRY AND ROBERT CARTER. Jacksonville State University—Community analysis of green pitcher plant bogs in northeast.

Populations of the endangered green pitcher plant (*Sarracenia oreophila*) are located in scattered location in northeast Alabama. Analysis of species composition, soil, and landform variables revealed a unique suite of species and soil characteristics indicative of sites that do or potentially could support green pitcher plant populations. This research will aid in recovery and restoration of green pitcher plant bogs.

- P71 SHELTON, JASON AND ROBERT CARTER. Jacksonville State University—Germination rates of green pitcher plants, *Sarracenia oreophila*, with respect to simulated nutrient release and soil saturation.

The germination rates of green pitcher plant seed from four populations were determined in this initial phase of a broader examination of seedling microsites. The influence of soil moisture and nutrient flux on germination was also examined. The results will provide baseline information required for the restoration of green pitcher plant populations.

- P72 BUDISCHAK, SARAH A.¹, PATRICIA A. PERONI¹ AND JONATHAN G. RIPPERTON². Davidson College¹ and UNC-Asheville²—The effects of seed age on seed viability, seedling performance, and sex ratios in white campion (*Silene latifolia*).

In order for seed banks to be an effective evolutionary strategy, seeds must not only remain viable, but also be able to germinate, grow, and compete against conspecifics and other competitors after years of burial. Using white campion (*Silene latifolia*), a dioecious perennial that maintains a dormant seed bank, as a model species, we examined how age affects the viability and germination rate of seeds and the performance of seedlings. Seeds were collected annually from small isolated population fragments of a larger metapopulation in southwestern Virginia over a 5-10 yr period and then stored under dry, laboratory conditions. Some seeds remained viable after 11 years, but percent viability varied among populations. Increasing seed age was associated with significant decreases and delays in germination. We measured seedling performance as a function of seed age for samples from three of the populations. Upon germination in the growth chamber, we planted the seeds in the greenhouse and measured variables associated with developmental rate and seedling size to assess seedling performance. Seedlings that originated from younger seeds emerged and produced true leaves significantly earlier than seedlings from older seeds. Seedlings from older seeds also tended to have significantly smaller leaves than those from younger seeds. Sex ratios of seedlings did not deviate significantly from 50:50 in even the oldest cohort of seeds. The decreased and delayed initial growth of seedlings from older seeds may put them at a competitive disadvantage to those from younger seeds. This project was funded by a NSF REU fellowship.

- P73 HIDAYATI, SITI N. AND JEFFREY L. WALCK. Middle Tennessee State University—Seed dispersal and germination strategies of two *Oenothera* species (*Onagraceae*) in temperate North America.

Capsule dehiscence, seed dispersal, and seed dormancy-break and germination were examined for two *Oenothera* species in Tennessee: *O. macrocarpa* Nutt. and *O. triloba* Nutt. Capsules of *O. macrocarpa* opened during 60 d of alternating 1-d wet at 22°C and 3-d dry at 5 or 60°C, whereas those kept continuously dry remained closed. In the field, these capsules opened primarily in December and January. In contrast, *O. triloba* capsules opened within 20 min when wetted and closed within 18 h during drying. Opening and closing of capsules for *O. triloba* in nature corresponds to precipitation events. Fresh *O. macrocarpa* seeds collected in July 2000 and 2001 germinated to 0-3% at 15/6, 20/10, 25/15, 30/15, and 35/20°C in light, and cold-stratified seeds germinated to 89-100% at 20/10-35/20°C. Seeds removed from *O. macrocarpa* capsules that remained in the field did not germinate to high percentages until January or February. On the other hand, fresh *O. triloba* seeds collected in July 2000 germinated to 1% at 15/6°C and 95-100% at 20/10-35/20°C in light, and seeds retained in capsules in nature between August 2000 and 2001 germinated to high percentages. Thus, seeds of *O. macrocarpa* are dormant at maturity and require low (winter) temperatures to become nondormant; germination in the field occurs in early spring. Seeds of *O. triloba* are nondormant at maturity and can readily germinate following rainfall throughout the year. Capsules of both species opened by water absorption (hygrochasy), which is a feature usually found amongst plants of arid regions.

P74 VICK, JOSEPH¹, ANNA STEPHENSON² AND MARK FISHBEIN³. Shorter College¹, Whitman College², Mississippi State University³—The role of pollinators in an *Asclepias* hybrid zone in Shenandoah National Park, VA.

Hybridization makes gene flow possible between species, resulting in speciation, increased genetic diversity, or merging of parental populations, among other effects. To hybridize, compatible parental species must overcome reproductive isolation through cross-pollination. With the formation of F₁ hybrids and subsequent formation of backcrosses, interspecific gene flow is possible. However, the outcome of hybrid formation depends on the response of pollinators to the phenotypes of hybrids relative to parental species. We studied the visitation rates and effectiveness of pollinators in a milkweed hybrid zone in Shenandoah National Park, in the Blue Ridge Mountains of Virginia. *Asclepias exaltata* (poke milkweed) and *A. syriaca* (common milkweed) are well-differentiated species that hybridize at this site. Hybrid plants display a range of intermediate morphological characters. Analyses of isozyme data show that both F₁s and various backcrosses are present. We found that the two parental species differed in the most common floral visitors (bumblebees on *A. exaltata* and silver-spotted skippers on *A. syriaca*) and that *A. syriaca* received significantly more visits. Hybrids received visits commonly from bumblebees and skippers, but had overall rates comparable to *A. exaltata*. Overall, floral visitors were more effective at pollinating *A. syriaca* and hybrids than *A. exaltata*. *A. syriaca* was best pollinated by honeybees and hybrids were best pollinated by bumblebees. Silver-spotted skippers were the only pollinators that were effective on both parents as well as hybrids, which suggests that they play an important role in the hybridization of these species.

P75 RITCHIE, JERRY C.¹ AND DENNIS C. GITZ². USDA ARS Hydrology and Remote Sensing Laboratory¹ and USDA ARS Cropping Systems Research Laboratory²—Root development of field grown eastern gamagrass.

Eastern gamagrass cv. "Pete" [*Tripsacum dactyloides* (L.) L.] seeds were planted in a 30 x 30 m plot in 0.75 m wide rows on May 15, 2002. The plot was irrigated to insure germination. Twelve minirhizotron access tubes (1.5 m length) were installed parallel to the rows at 45-degree angle and installed in pairs either within or midway between the rows. Images of root development were collected at 13.5 mm intervals to a depth of approximately 1 m (100 images for each tube). *In situ* images were collected at

approximately 1-week intervals in 2002, 2-week intervals in 2003, and 3-week intervals in 2004 using a Bartz minirhizotron imaging system. One month after emergence total root occupancy (percentage of images along the tube exhibiting roots) was 1.5 and 0.0% within and between rows, respectively. By the end of the first year occupancy was 45% within the rows and 15% between rows, with a few roots observed reaching a depth of 1 m. By the end of the second year approximately 60 and 30 % of the images had roots with many below 1 m at the in-row sites. At the end of the third year occupancy was similar to the second year but the numbers and dimension of roots had increased. This study shows both how rapidly roots develop in eastern gamagrass plants and is suggestive of a fan-like distribution of roots under the developing crowns.

P76 ERVIN, GARY N., MELISSA SMOTHERS AND CORI ANDERSON. Mississippi State University—Relative importance of wetland type vs. local land use/cover in determining susceptibility to invasive plants.

Invasion of natural ecosystems may be influenced by propagule pressure (a function of dispersal ability and opportunity), the traits of the invasive species, and the resilience of the native plant community. We assessed invasibility of wetlands by conducting surveys of three wetlands in each of five wetland categories (riverine, depression, lacustrine fringe, mineral flat, and slope). Invasibility was measured as the number of invasive species present, percent of plant species classified as invasive, percent cover of invasive plants, and percent of total cover represented by invasive species. The working hypothesis for this study was that certain types of wetlands (e.g., lacustrine fringe and riverine) would be more prone to invasion than others (spring-seep/slope wetlands or mineral flat wetlands). No significant differences were found among wetland types in any of the invasion metrics evaluated, despite high apparent invasibility in the riverine and lacustrine fringe categories. However, invasion was correlated very strongly with a qualitative index of anthropogenic modification to the surrounding landscape (disturbance rank; $R^2 = 0.95$). Because of the large influence of human activities on wetland invasion and high variability in disturbance rank among wetlands within types, any effects that might be attributable to greater opportunity for dispersal in certain types of wetlands over others, in unmodified landscapes, were obscured in this study. These results further highlight the overwhelming contributions of anthropogenic habitat modification and human-assisted dispersal of invasive species to the currently observed homogenization of natural ecosystems.

P77 MACHIDA, SADAYUKI AND SIGURDUR GREIPSSON. Troy University—Growth responses of kudzu (*Pueraria montana*) a non-native invasive plant to three different soil types.

Invasion of non-native plants is an economic problem worldwide. Kudzu is one of the most notorious invasive non-native plant in the Southeastern USA; it spreads along disturbed areas into natural and semi-natural ecosystems. Kudzu can form dense monoculture and it outcompetes native vegetation. This study examined the hypothesis if kudzu forms effective symbiotic relationship with resident soil microorganisms; especially arbuscular mycorrhizal fungi (AMF) and *Rhizobium* bacteria. Kudzu seeds were treated with sulfuric acid and germinated. Seedlings were planted in three types of soil: (1) native forest, (2) kudzu invaded site and, (3) sterilized forest soil. Soil was sterilized by autoclaving it for 1 h at 121°C at 1.5 atm. Plants were grown in pots (n=3) in a growth chamber for two months. AMF root colonization was estimated by staining roots with Trypan blue and *Rhizobium* nodule formation was monitored. Plants grown in the sterilized soil grew poorly and showed signs of chlorosis and necrosis. Plants grown in the forest soil grew significantly better than those in the sterilized soil and AMF root colonization (40%) was found in one plant; no nodules were found on the roots. These results strongly suggest that kudzu can form symbiosis with resident soil microorganisms and in turn it can facilitate the invasion of this notorious alien plant.

- P78 ROBERTS, ANDREW AND SIGURDUR GREIPSSON. Troy University—Incidence of arbuscular mycorrhizal fungi (AMF) root colonization of plants across coastal sand dune ecosystem on Dauphin Island, Alabama.

The incidence of arbuscular mycorrhizal fungi (AMF) on plants found across the coastal sand dune ecosystem of Dauphin Island, Alabama was examined. Four ecozones were established: shore, foredune, maindune, and backdune. Plant species were easily confined to ecozones; 29% of plants on the shore were not found in any other ecozone; 5% of plants were confined to the foredunes; 10.5% of plants were found on the backdunes. The majority (73%) of plant species examined belonged to families that typically host AMF species. Root samples were collected in each ecozone. Roots were stained with Trypan blue and the AMF colonization was determined. The shore plants collected in the fall and spring had generally significantly highest percentages root AMF colonization. These results are inconsistent with the hypothesis that AMF root colonization increases with dune stability from shoreline to backdunes. Unusually high AMF root colonization was found in plants of the families Aizoaceae and Amaranthaceae on the shore that are typically considered to be non-AMF dependent. The AMF colonization in these species could be due to direct contact of roots of neighboring plants that are known to be AMF dependent which could consequently colonize the non-AMF dependent species. Plants on the shore and the foredunes were greatly affected by sea-erosion and hurricane impact which could in turn influence the unusually high values of AMF root colonization.

- P79 ROBERTS, MELINDA D.¹, HOWARD S. NEUFELD¹, ALAN W. DAVISON² AND ARTHUR H. CHAPPELKA³. Appalachian State University¹, University of Newcastle-Upon-Tyne², Auburn University³—The influence of water relations on the response of cutleaf coneflower to ozone.

Ozone is the most important gaseous air pollutant causing foliar injury to plants. Cutleaf coneflower (*Rudbeckia laciniata* var. *digitata*), a native perennial sunflower in Great Smoky Mountains National Park, is sensitive to ozone and has the ability to live in environments from full shade to full sun. Because of the susceptibility and availability of plant populations in Great Smoky Mountains National Park, cutleaf coneflower has become the subject of much investigation to provide a better understanding of how ozone affects native wildflowers. The objectives of our study were to measure and analyze the interaction between ozone and the water relations of cutleaf coneflower. We hypothesized that drought or shaded plants would have lower stomatal conductances, resulting in less ozone uptake and reduced physiological damage. Effects of light and drought were measured by establishing five blocks in shade and five blocks in full sun, each consisting of a control, watered and droughted plot (10 blocks, 30 plots). In each plot we measured stomatal conductance, water potential, soil moisture, and foliar injury. Stable carbon isotope ratios (C^{13}/C^{12}) and starch levels will be used as independent measures of water use efficiency and photosynthetic potential in response to the imposed treatments. Transpiration rates were simultaneously measured in four sensitive and four insensitive plants in the sun using Dynagage sap flow sensors to determine if ozone affected water use in these plants. The results of our study will be used to refine models of ozone response in coneflowers as affected by light and drought.

- P80 DOLAN, CHRISHA¹, HOWARD S. NEUFELD¹, RUTH A. DEWEL¹, J. KENNETH SHULL¹, ALAN W. DAVISON², ARTHUR H. CHAPPELKA³ AND KENT O. BURKEY⁴. Appalachian State University¹, University of Newcastle-Upon-Tyne², Auburn University³, and USDA-ARS Air Quality Research Unit⁴—The role of leaf anatomy in determining the sensitivity of individuals of cutleaf coneflower (*Rudbeckia laciniata* var. *digitata*) to ozone.

Cutleaf coneflower populations (*Rudbeckia laciniata* var. *digitata*) in Great Smoky Mountains National Park are comprised of individuals that differ in the extent to which they develop typical ozone injury symptoms. Sensitive plants develop foliar injury earlier in the season, and have significantly greater injury by the end of the season. Previous work indicated no differences in stomatal conductance on uninjured leaves between sensitive and insensitive individuals, nor any appreciable differences in apoplastic ascorbate antioxidant capacity. In fact, coneflowers have almost no reduced apoplastic ascorbate. Thus, neither differences in ozone uptake nor ascorbic acid metabolism appear responsible for variations in ozone sensitivity among individual coneflower plants. However, variations in internal leaf anatomy could be a factor in ozone sensitivity. Plants with greater internal airspaces, and lower cell densities are known to be at greater risk from ozone. We sampled leaves from sensitive and insensitive plants at the Appalachian Highlands Science Learning Center at Purchase Knob, near Waynesville, NC, and prepared them for light and electron microscopy. One sample set was incubated with cerium chloride to determine if sensitive plants produced more H₂O₂ than insensitive plants. Preliminary results indicate no differences among sensitivity types regarding stomatal densities on either adaxial or abaxial leaf surfaces. Ongoing work involves measuring leaf thickness, palisade and spongy mesophyll thickness, internal exposed cell surface area, and cell wall thickness for both sensitive and insensitive plants. Results will be incorporated into a mechanistic model of cellular ozone sensitivity developed by Plöchl and others at the University of Newcastle.

- P81 NEUFELD, HOWARD S.¹, MELISSA WOODS¹, ALAN W. DAVISON², ARTHUR H. CHAPPELKA³, KENT O. BURKEY⁴, PETER L. FINKELSTEIN⁵ AND SUSAN SACHS⁶. Appalachian State University¹, University of New Castle Upon Tyne², Auburn University³, USDA-ARS Air Quality Research Unit Plant Science Research⁴, Atmospheric Modeling Division-NOAA at USEPA⁵, Appalachian Highlands Science Learning Center at Purchase Knob⁶—Reduced reproductive effort in ozone sensitive cutleaf coneflower (*Rudbeckia laciniata* var. *digitata*) clones in Great Smoky Mountains National Park

Ozone is the most important gaseous pollutant in Great Smoky Mountains National Park, and may cause foliar injury on nearly 6% of the Park's flora. For the past five years, we have been studying the impacts of ozone in the Park on cutleaf coneflower (*Rudbeckia laciniata* var. *digitata*) and have documented the presence of foliar injury in the field that correlates with decreases in photosynthesis and stomatal conductance. Populations of coneflower are comprised of sensitive and insensitive individuals, with sensitive plants developing foliar injury earlier in the season, and to a greater extent by the end of the season. However, we have not yet been able to find any effects of ozone on aboveground growth or reproduction. In 2004, we measured reproductive effort in 20 sensitive and 20 insensitive individuals at the Appalachian Highlands Science Learning Center at Purchase Knob, near Waynesville, NC. Sensitive plants produced 36% fewer flower heads than insensitive plants (5.35 vs 8.60, pooled se = 0.79, $p < 0.01$). We are currently measuring numbers of seeds per flower head, and total seed weight per plant. Overall reproductive effort: [mean seed wt./seed]*[number of seeds/head]*[number of heads/plant] will be calculated for both groups of plants. Two nonexclusive hypotheses arise: (1) sensitive plants may have intrinsically lower reproductive effort even in the absence of ozone, and (2) ozone may cause differences in reproductive effort between sensitive and insensitive plants. Field studies of reproductive effort in filtered vs ambient air will eventually be needed to distinguish between these two hypotheses.

- P82 CIPOLLINI, MARTIN¹, AMY GASKELL² AND CHRISTOPHER WORRELL¹. Berry College¹ and Stephen F. Austin University²—Use of herbicide and prescribed burning to control hardwoods in the regeneration and restoration of Mountain Longleaf Pine habitats.

Hardwood control is a problem in the regeneration and restoration of Longleaf Pine (*Pinus palustris*) stands. Data concerning hardwood management techniques are generally lacking for Mountain Longleaf Pine habitats in NW Georgia and NE Alabama. In this study, three experiments were set up on the Berry College campus to evaluate the effects of herbicide and prescribed burning in hardwood control: 1) an evaluation of Garlon 3A in the control of hardwood re-sprouts in a clear-cut area planted with Mountain Longleaf Pine seedlings; 2) an evaluation Arsenal injection in the control of hardwoods in mature Mountain Longleaf Pine stands, and; 3) an examination of the effects of a spring prescribed fuel reduction burn in mature stands. In the first experiment, hardwoods were treated by foliar spray in June 2004, and effects measured four weeks later. In the second experiment, hardwoods in five mature stands were injected in March 2004 and effects measured in July 2004. In the third experiment, fuel analyses were taken before and after an April 2004 prescribed burn (two study stands), and from burned and unburned areas (three study stands). Hardwood re-sprouts reacted differently to Garlon 3A, with certain species (e.g., Sweet-gum) showing resistance to the herbicide. The Arsenal injection results were confounded by the prescribed burn, but Red Maple was significantly negatively affected by the herbicide treatment independent of the effects of burning. Finally, fuel analysis showed limited effects on the abundance of small hardwoods despite considerable reduction of litter, duff and downed woody fuels.

- P83 ANDERSON, CAROLINE A. AND A. JOSEPH POLLARD. Furman University—Variation in nickel accumulation in *Senecio plattensis* from the Buck Creek olivine deposit, North Carolina.

The Buck Creek olivine deposit is an ultramafic outcrop in the Nantahala National Forest of western North Carolina, with soils that are naturally rich in magnesium, nickel, cobalt, and chromium. One of the most abundant forbs on the outcrop has been tentatively identified as *Senecio plattensis* (= *Packera plattensis*). These plants commonly accumulate 100-300 ppm nickel in their leaves, which is about ten times higher than found in most other vegetation in the area. We studied whether there is significant variation in foliar nickel concentration. Leaves were collected from three sites within the ultramafic area. At each site, four leaves were removed from each of ten plants. Leaves were dried, ashed, dissolved in nitric acid, and analyzed by atomic absorption spectrophotometry. There were statistically significant differences between sites and between plants within site. Nickel concentration in leaves was not correlated with total nickel concentration in soil samples from the root zone. Despite the significant differences between plants and sites, about half of the total variance was among leaves within plants. Considerable recent attention has been focused on hyperaccumulation of heavy metals in leaves. The concentrations observed in *S. plattensis* are below the level recognized as hyperaccumulation, but might represent an evolutionary precursor to it. Further exploration of this evolutionary process will require clarification of the genetic basis of the observed phenotypic variability in nickel accumulation.

- P84 KELLER, HAROLD W.¹, STEPHEN W. WILSON¹ AND PATRICIA A. SMITH². Central Missouri State University¹ and Warrensburg R-VI Middle School²—National Science Foundation-Research Experience for Teachers: biodiversity survey (Myxomycetes and insects) of Pertle Springs, Warrensburg, Missouri, by 7th grade life science students.

NSF-RET awards aim to provide professional development opportunities for K-12 teachers of science through strengthened partnerships between institutions of higher education (CMSU) and local school districts (WMS). The objectives are to: allow a 7th grade life science teacher, Trish Smith, to participate in summer tree canopy biodiversity field research in Great Smoky Mountains National Park; learn collection techniques, laboratory culture procedures, and identification of selected taxa from a multidisciplinary research team of experts and university students; provide parallel research experiences for 7th grade students in order to increase their interest in biology and careers in science; and extend the benefits to secondary students and teachers by establishing an interactive, inquiry-based website focusing on student research experiences. Students will experience the three phases of research emphasized in the NSF grant: Adventure Phase (sampling and collection of field data); Laboratory Phase (sample sorting, preparing and scanning bark from living trees in moist chamber cultures for myxomycetes, fungi, lichens, mosses, liverworts, algae, myxobacteria, tardigrades, and insects, and learn to identify through the use of taxonomic keys some of these organisms); Publication Phase (poster and oral platform presentations and writing topical narratives). The first tier of the "iAdventure" website (<http://warrensburg.k12.mo.us/iadventure/GSMNPiadventure/>) will provide students and teachers with a virtual tree canopy research experience and enable them to learn more about the All Taxa Biodiversity Inventory study in GSMNP. Funded by the National Science Foundation DEB Award #0343447, Discover Life in America Award #2004-6, and National Geographic Society Committee for Research and Exploration Award #7272-02.

P85 SCHAUS, MAYNARD H., J. CHRISTOPHER HALEY AND GARRY E. NOE.
Virginia Wesleyan College—Development of a flexible computing lab space for environmental science courses.

In summer 2002, we developed a flexible computing space for lab courses in environmental science, which integrated laptop computer use and Geographic Information Systems (GIS) technology into several courses in the curriculum. The flexibility of this lab allows students to take out computers when necessary for data analysis or GIS use, and put them away during "wet" or "dirty" labs. Environmental Biology and Ecology courses used laptops for data analysis during the majority of field and lab experiments, as well as simulation modeling using STELLA software. Environmental Biology students also quantified land use across a gradient of urbanization (forest, park-like campus areas, residential houses, apartments, shopping center) using air photo interpretation and GIS and combined these data with surveys of bird community composition across sites. Geology courses used computers extensively for a variety of GIS projects and data analysis on field collected samples. The Introduction to GIS course utilized the laptop computers extensively and allowed students in this course to have a dedicated laptop for storage of long-term GIS projects, enhancing the depth and creativity of these projects. This flexible space has also been utilized for PowerPoint lectures in several classes as well as 4 independent research projects involving undergraduates. Overall, the flexibility and enhanced capability of this lab has greatly enhanced our ability to teach concepts in these courses and has improved student familiarity with commonly used technologies in environmental science. Funding for this project was provided by the National Science Foundation's Course, Curriculum and Laboratory Improvement Program.

The *Southeastern Naturalist* . . .

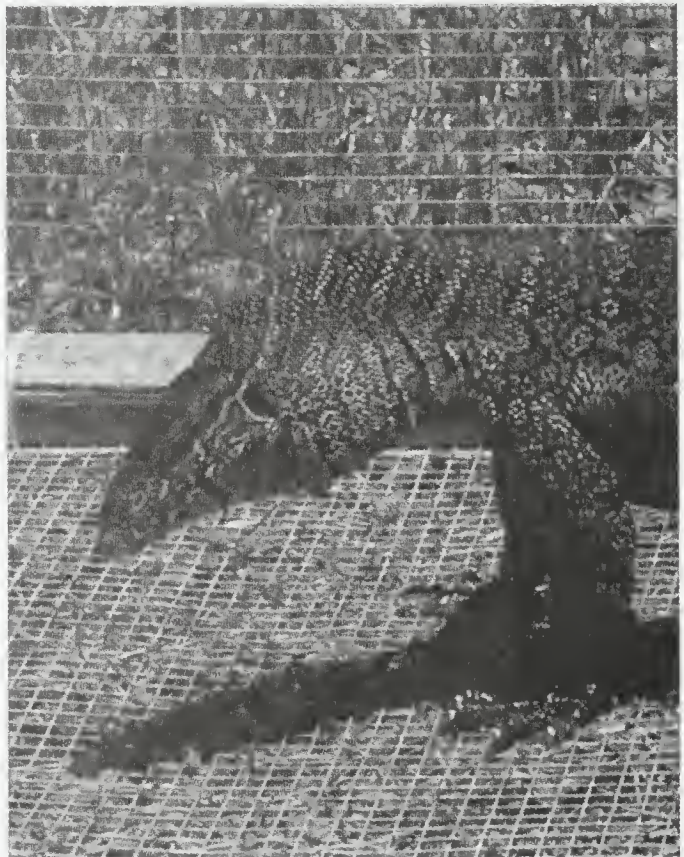
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Southeastern Naturalist

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Southeastern Naturalist

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Publication Date: December 31, 2004



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NEWS OF BIOLOGY IN THE SOUTHEAST

Leon Jernigan—News Editor, Department of Biology
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ABOUT PEOPLE--MARYLAND

Jerry C. Ritchie, an Agricultural Research Service (ARS) soil scientist, has been named the "ARS Beltsville Area Senior Research Scientist for 2004." Ritchie received a plaque and cash award at U.S. Department of Agriculture headquarters February 9, 2005, and will also receive additional research funding. ARS is the USDA's principal scientific research agency.

"Dr. Ritchie is internationally recognized for his impact on, and leadership in, soil and water conservation research and applications," said Edward B. Knipling, ARS administrator. Based at the Hydrology and Remote Sensing Laboratory in Beltsville, Md., Ritchie was honored for "continuous research and leadership in soil and water conservation on ways to manage, conserve and improve the quality and sustainability of soil and water resources." Over his 36-year career, Ritchie has achieved national and international recognition for his scientific contributions, including:

- Mapping water quality from space satellites.
- Measuring landscape with laser altimetry technology that can correlate surface roughness to soil moisture, erosion and crop yields.
- Using grass hedges as "living fence" buffers to improve marginal soils and block runoff before it reaches sensitive riparian areas.
- Estimating carbon stored on farm fields, small reservoirs and wetlands significantly affecting the calculation of carbon storage worldwide. ☞

Deadlines for the submission of "news."

January issue: October 28.

September issue: July 13.

April issue: January 13.

December issue will not contain "news."

The NEON Project

For further information or to comment, contact:

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Public Information Representative
NEON Project Office
(202) 628-1500, x215
djohnson@aibs.org

Planning for the NSF-funded National Ecological Observatory Network (NEON) is on a fast track. A distinguished body of scientists, engineers, and educators has been selected to serve on the committees that will shape the blueprint for NEON's implementation. Members of the biological community will have a number of opportunities to review and comment on draft materials as the NEON Design Consortium produces documents early in 2005.

In September 2004, AIBS finalized a cooperative agreement with the National Science Foundation to develop a detailed NEON planning document by June 2006. The NEON Design Consortium—with more than 150 committee and subcommittee members—formally begins its work with meetings in January, March, and June of 2005. The committee reports will identify which continental-scale science questions NEON will address, what kinds of sensor technology and cyberinfrastructure will be required, and how to realize NEON's potential for educating new generations of scientists.

The eight Subcommittees of the Science and Human Dimensions Committee will focus on invasive species, land use, biodiversity, biogeochemical cycles, climate change, infectious disease, hydrology, and emerging issues. Additional subcommittees will develop NEON's approaches to research infrastructure, IT and communication, and sensors and sensor networks. Education subcommittees will address NEON opportunities for K-12, the graduate and postdoctoral level, and informal education.

Members of the bioscience community can find the latest news about NEON at www.neoninc.org, including a full roster of NEON's Design Consortium members. Draft documents will be posted online for peer review shortly after each of the three meetings scheduled in 2005: January 4-6, March 15-17, and June 7-9.



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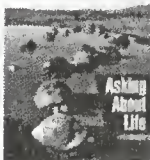
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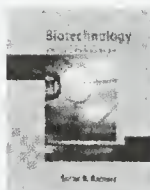
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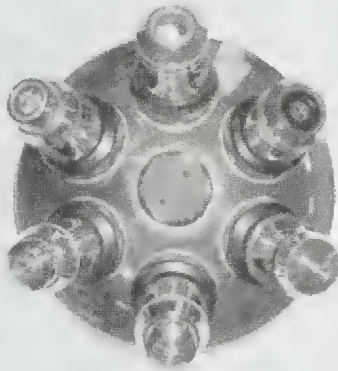
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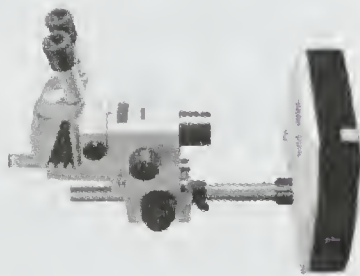


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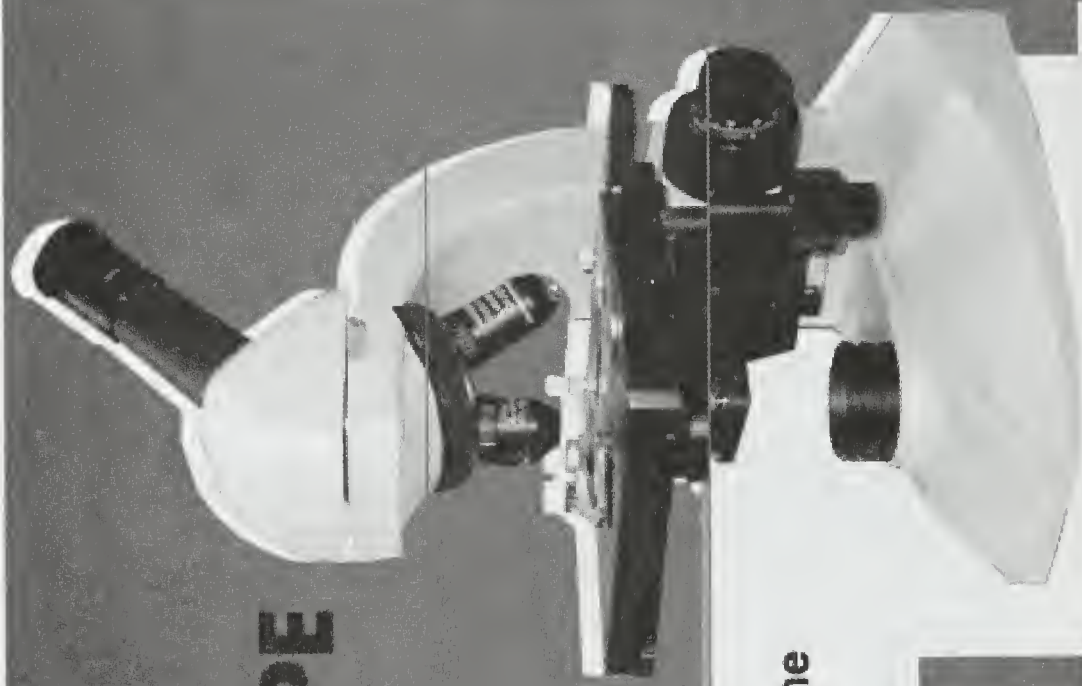
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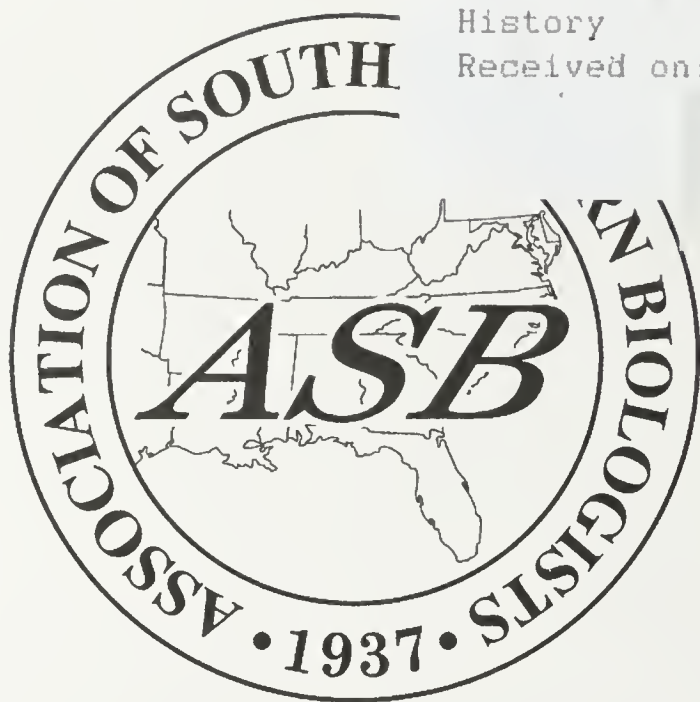
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SOUTHEASTERN BIOLOGY

VOLUME 52, NUMBER 2, April, 2005

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